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SPREAD OF THE LEOPARD MOTH IN CONNECTICUT AND ITS INJURY TO SHADE TREES

By W. E. BRITTON, *Agricultural Experiment Station, New Haven, Conn.*

The most destructive insect pest of shade trees in New Haven at present is the leopard moth, *Zeuzera pyrina* Linn. This insect is now at work in nearly every city and town along the Connecticut coast from New York State to the Rhode Island line. It is chiefly a town and city insect, and apparently does little harm in the open country.

First appearing in this country at Hoboken, N. J., more than thirty years ago, the leopard moth has spread slowly southward and inland, but has spread much more rapidly to the north and east, and especially along the coast. At present it is known to be distributed from Asbury, N. J., to Lawrence, Mass., and in no case has it been recorded as occurring inland more than twenty-five miles.

Though according to Professor J. B. Smith,[1] Colonel Pike as early as 1894 reported that the leopard moth had reached Connecticut, the first definite record was made by Mr. H. M. Russell, who collected adult moths at Bridgeport in 1901.[2] The first Connecticut specimen in the collection of the Agricultural Experiment Station was a male captured at New Haven, July 1st, 1907, by Professor H. W. Foote of Yale University. But the insect must have been present in New Haven for some years, as photographs taken about that time and

[1] Insect Life, Vol. vii., p. 138.
[2] Bureau of Entomology, Circular 109, p. 3.

recently examined show that the trees were then badly injured by its attacks.

Many of the magnificent elms on the central green, planted one hundred and twenty years ago, have recently died and have been removed. Though seriously injured by the repeated attacks of the elm leaf beetle, lack of nourishment and several other troubles, the immediate cause of death appears to be the leopard moth. Similar conditions exist in Wooster Square and the Broadway green, and also along the streets in the older parts of the city where trees still exist. Elms and silver maples seem to be preferred to other trees, though nearly all kinds are subject to attack. The insect is not confined to the center of the city, but is working in silver maples around the outskirts adjacent to the open country.

In Bridgeport the conditions are nearly as bad as in New Haven, but in the smaller coast cities like Stamford, South Norwalk and New London, the injury, though present, is not as serious or as widespread. We have not examined all of the inland cities, but the pest does not appear to be present in Hartford. A little injury at Danbury is reported by Mr. F. A. Bartlett. Danbury is about twenty-five miles inland, or as far from the coast as the pest has yet been recorded in America. At Wallingford, twelve miles from New Haven, the damage is rather severe.

Infested trees in late summer and fall drop many twigs which break off during storms and high winds because tunneled by the small larvæ, which usually fall with the twigs. Some twigs wilt and hang upon the tree, but this is more apt to take place the second summer, when the borers are larger, and larger branches are attacked. After several years of injury a tree exhibits dead branches above the foliage mass, giving it the well-known staghorn appearance. The branches die because they are quite or nearly girdled, and though the tree may sprout below, the new growth is at once attacked, and the tree soon dies.

On old trees having rough bark, like the elm, it is difficult to detect the burrows, and this can be done only by a close examination of the under sides of the branches. The frass and the white covering of the outlet are the chief guides, and the latter may be between plates of bark so as to escape notice altogether. On young trees having smooth bark, like the maples, it is a much simpler matter, and the borers may be killed by the use of a hooked wire or by injecting carbon disulphid into the tunnel and closing the outlet.

In the vicinity of New Haven the adults fly from about June 20th to the first week in August, but they are most abundant the first half of July. Males are numerous around the arc lights in the evening.

also females, though much less common, may be found resting on telephone poles and on the trees. The females are poor flyers, and do not as a rule go far from the point where they emerge. For this reason trees set closely, with branches interlacing, are usually more severely injured than those well separated from each other.

In cities, many larvæ in the fallen branches are killed by being carried away and burned. Bats unquestionably devour many adults, mostly males, around electric lights. It is thought that birds, particularly woodpeckers, have prevented the leopard moth from spreading into the open country. In Europe four parasites are known, one of them having long been recognized in this country, but not as attacking the leopard moth. In fact, no American parasites have been observed. Doctor Howard has promised to import the European species in the hope of bringing relief to the infested cities of the northeastern states.

It is outside the scope of this brief paper to give a description or life history of the leopard moth, but full accounts, with references to literature, may be found in Bulletin 169 of the Agricultural Experiment Station, New Haven, Conn., which has just been sent to the members of this association, and also in a recent paper by James W. Chapman, entitled "The Leopard Moth and Other Insects Injurious to Shade Trees in the Vicinity of Boston," published by the Bussey Institution of Harvard University.

A THIRD BROOD OF CODLING MOTH IN KANSAS IN 1911

By L. M. Peairs, *Manhattan, Kan.*

During the summer of 1911 the Kansas experiment station carried on several tests in orchards in northeast Kansas and also conducted spraying demonstrations in other orchards in this section. The writer was in charge of the work in these orchards and had, in the course of the work, opportunity to make quite extensive observations on the behaviour of the codling moth throughout the greater part of the season.

While nothing greatly out of the ordinary occurred early in the season, the conduct of the insect was so different in September from the recorded habits that it was evident that an abnormal condition obtained. This could be explained only by the assumption that a third brood had been produced.

The season was in many ways, abnormal. A spring with not more than the normal amount of rainfall was followed by severe and practically unbroken drouth throughout May, June, July, and a part of August. Some rain fell late in August and in September the rainfall

was rather heavy. The drouth was accompanied by excessive ... continuing until about September. September conditions were ... more like June than autumn.

The apples were not noticeably undersized in spite of the dry we... perhaps because it was an "off year" for the apple crop and ... trees were heavily loaded.

In the course of the experimental work counts were made of all ... apples set on over one hundred trees but bands were placed on ... fifteen unsprayed trees in Doniphan county orchards and it was ... these trees that all data used here was obtained, although it was ... dent that similar conditions obtained in the other orchards. Band records were not quite complete as some collections were missed du... August when the writer was forced to be absent from the orchards but the records from the fallen fruit show that the band records, though incomplete, are not misleading. It was at first the intention to keep emergence records of all larvae collected but other work interfered so only pupation records were kept. In the following table the numbers recorded as having pupated does not indicate the true percentage, as most of those larvae which did not pupate, especially in the early part of the season, died.

THE BAND AND PUPATION RECORDS

Date	Number larvae collected	Number pupated	Number emerged	Number ...
(Fifteen trees)				
May 30	42	31	26	...
June 5	66	57	.....	...
11	71	51	37	...
21	189	118	.....	...
July 1	247	201	.....	...
9	279	141	.....	...
12	167	122	.....	...
19	141	98	.....	...
Aug. 1	89	52	.....	...
18	87	60	.....	...
31	119	98	.....	...
Sept. 12	201	185	97	...
21	164	96	48	...
[2]Sept. 30	148	73	.....	...
Oct. 7	89	47	19	...

The writer's experience with the codling moth and all publish... records from this latitude indicate that by far the greater percenta... of those larvae coming down from the trees after August 1st do ...

[1] Pupae collected under bands counted as larvae. [2] Last two collections from 11 trees only.

pupate but pass the winter as larvæ. One notable exception to this has occurred in Kansas in 1910. Here records taken for the Kansas station by Mr. Hillis at Parker show considerable moth emergence up to the tenth of September. In this case these were thought to be only belated individuals of the second brood but some of them may have been third brood moths.

The band records above show a normal first brood with the second brood larvæ appearing about August first and continuing until picking time. The remarkable feature of these records is the pupation. In place of stopping with the first brood larvæ it continued until the very last collection of larvæ.

In the orchards during picking time moths were abundant and eggs on foliage and fruit were more plentiful than at any previous time. It was not unusual at this time to find five or six eggs on a single apple, and almost no apples were free of eggs. From September 10th to picking time 50 per cent more damage was done than in the entire season previously. Young larvæ began to be numerous about September 15th, and were increasingly so up to the time all the apples had been picked. On October 18th, of four hundred apples showing moth injury, 320 had young larvæ present in the fruits, and many of the apples had more than one. Over ninety per cent of these larvæ were less than three eights of an inch in length and certainly were not more than fifteen days old.

The first frost of the season occurred on October 19th and as most of the apples were harvested at this time, it is probable that many of the late larvæ failed to survive. It will be interesting to watch developments in the same orchards next season.

While the foregoing notes do not prove absolutely the presence of a third brood, it does show a very unusual state of affairs which can best be explained by the assumption that there was a third brood and that it was, perhaps, induced by the very unusual weather conditions. It is unfortunate that arrangements were not made to observe certain individuals and their progeny throughout the season so that we would have irrefutable evidence, but since this was not done the observations recorded may prove of interest to some.

INSECTS OF THE YEAR 1911 IN MASSACHUSETTS

By H. T. Fernald, *Amherst, Mass.*

No unusual destruction by insects has been observed in Massachusetts during the year which has just closed. On the other hand, many different kinds have contributed toward the loss which has

been experienced and several not usually met with have been in evidence.

The unusually hot, dry summer was of course, favorable to the rapid increase of plant lice and the San José scale. Cutworms were also very abundant and did much damage, and the elm-leaf beetle was unusually destructive, though in most towns this pest is now quite well kept in check by spraying. It was first found in Nantucket this summer in small numbers, on five or six elms near the center of the town, not as perhaps might have been expected, on the trees nearest the wharves.

The leopard moth, *Zeuzera pyrina* L., is now present almost everywhere in eastern Massachusetts near the coast, and has even reached Nantucket. It does not seem to have worked its way far inland, however, and as in other states, its injuries are most pronounced in the cities and larger towns.

The twelve-spotted asparagus beetle, *Crioceris 12-punctata* L., which has been working its way northward, was taken at Concord and Roslindale near Boston in 1909. It was not observed at Amherst until last summer, which might indicate a more rapid dispersal along the coast than inward.

The cottony maple scale, *Pulvinaria innumerabilis* Rathv., has been unusually abundant in the Connecticut Valley this year, many of the soft maples being so thoroughly covered with it as to have made little or no growth. This is the first time for several years that this insect has attracted any attention in the state.

In 1910 the white birches throughout New England were attacked by the birch-leaf skeletonizer, *Bucculatrix canadensisella* Chamb., and almost without exception, the leaf tissues were entirely consumed. As scrub birch is so abundant everywhere in this part of the country, much attention was directed to this insect and many inquiries as to the likelihood of the destruction of the trees were received. During the past fall the insect was again in evidence, but to a less degree, only a small portion of the foliage being destroyed, and as a whole the greatest injury appears to have been in localities where the pest was least abundant last year.

The cutleaved birches so much favored as ornamental trees have had a different experience. They have suffered equally with the native varieties, but in addition, for the last three years in the Connecticut Valley at least, they have also been attacked by the bronze birch borer, *Agrilus anxius* Gory, and in nearly every case where the insect has entered a tree, its death has followed, while the native birches have thus far appeared to be exempt.

The latter part of May some large chestnut trees in Amherst were

reported as dying. An examination showed that they had been recently girdled, close to the ground, and full grown larvæ, pupæ and adults of *Leptura zebra* Oliv. were found in the burrows.

For several years the elm-leaf miner, *Kaliosysphinga ulmi* Sund., has been present in considerable abundance. Last year this insect was less noticeable than in 1909, but during the past summer its work on Camperdown and European elms has been very noticeable. In many cases the parenchyma of all the leaves of the trees has been almost entirely consumed and the trees have made little or no growth.

Some facts which have been noted would seem to indicate that there are two generations a year of this sawfly in Massachusetts.

The work of the maple-leaf stem sawfly, *Priophorus acericulatis* MacGill., was quite noticeable in some parts of the state last spring. It had previously been noticed but has evidently become much more abundant during the last year or two.

A specimen of the roach, *Panchlora hyalina* Sauss., was taken near Amherst in a field at least half a mile from the nearest store. It is of course, to be presumed that it came in on some tropical fruit, but it is evidently liable to fly some distance, and may therefore be met with almost anywhere.

During June the members of an elementary class in Entomology at the college, interested in collecting insects, obtained a trolley car headlight with the requisite apparatus, and took it to a point where the local car line passes through a densely wooded area. There they established connections with the feed wire of the line and used the headlight to attract insects. The resulting catch included about twenty *Actias luna*, several *Telea polyphemus* and *Automeris io* moths, besides a large number of smaller Lepidoptera, in a little over an hour. Several trials of this method gave extremely good results, and suggests the possibility of using electricity at places where moths are most abundant, when trolley lines are properly located for this purpose.

On the 5th, 10th and 23d of June, blister beetles were received from correspondents in Stockbridge and Williamstown which were evidently of the genus *Pomphopæa* and which were kindly identified by Mr. Charles Schaeffer of the Brooklyn Museum as *Pomphopæa sayi* Lee. This insect has never before been received by the Experiment Station, and the data sent with the insects were of such interest as to be worthy of record. The Williamstown correspondent, under date of June 5, writes: "On the mountain ash tree where they were found, there were about a quart." One of the Stockbridge correspondents wrote, June 10: "Yesterday morning on entering my garden I found that these beetles had taken possession of the place. Every flower stock had been eaten down and the iris and roses were

fast being devoured. Lupins seemed to be the favorite and [illegible] one was left. The beetles seemed to be drunk with the nectar [illegible] they stuck to the flowers and we could easily cut the stock and drop it in a pail of kerosene. We caught hundreds in this way. Late in the afternoon, they seemed to have taken flight. There was a flight of about 300 on June 12, eating lupin, roses, syringas, iris, etc., eating the flowers and not the foliage. They appeared suddenly, over night. There was no special wind or other climatic conditions noticed. They were exterminated by hand and after a heavy rain at night none appeared next day."

The other Stockbridge correspondent, on June 23, wrote: "Three days ago I found these beetles eating the roses in the garden. They lighted, half a dozen or so, on one rose and devoured it rapidly. They were either so sluggish or so hungry that they were easily caught and the gardener drowned several hundred in an hour. Since then I have seen only a few scattered individuals. They seem tenacious of life, as specimens have lived three days in a box.

During the last ten years it has been of interest to note that the insects named by the New York State Entomologist in any year as attracting attention, were also as a rule, those receiving similar attention in the Connecticut report of that year, and it was usually safe to expect their presence in Massachusetts the following year. It would almost seem as though most of these cases of increase in abundance originated to the west, and reached Massachusetts from that direction. This has sometimes been so marked that the western end of the state would show an unusual abundance of some pest which the following year extended its injuries into the eastern end of the state.

The above is of course, only a generalization, but it has nevertheless occurred so often as to attract some attention.

INJURIOUS INSECTS OF 1911 AT TREESBANK, MANITOBA

By Norman Criddle

The season of 1911 had few surprises for the economic Entomologist and the injury done to crops and other vegetation was chiefly due to the continuous, or increased abundance of insects commonly met with the previous year. The most important of these are depicted in the following notes.

Insects Injurious to Grain and Grasses

Hessian Fly, *Mayetiola destructor*.—Infested spring wheat plants were gathered on May 17, being injured chiefly below the ground. The larvæ at this time were small and difficult to detect. On June

to adults began to emerge from the above mentioned plant and continued to do so for about a week afterwards but owing to lack of time and unsuitable breeding cages, I was unable to carry them farther.

In the past it has always been supposed that the Hessian fly was single brooded in Manitoba, but from the above observation there is strong reason for suspecting otherwise. I believe that eventually the life history will prove to be somewhat as follows: Adults appear from over wintering pupæ in early spring as soon as the first spring wheat shows above the ground upon which they deposit their eggs, this attack being confined to young plants. The insect reaches maturity about the second week in June, varying of course, with the seasons, and soon after lays its eggs upon stemmed plants from which we have the commonly noticeable breaking down of the stems in late July. Larvæ of this generation reach the pupal stage in August to appear as flies the following spring. Much of this surmise has already been partly worked out.

Injury to grain from Hessian fly was difficult to estimate owing to the similarity of attack to the lesser wheat-stem maggot. It does not, however, appear to have been extensive and very little damage was done by the, presumably, second brood.

The Lesser Wheat-stem Maggot, *Oscinis soror* ?. There are probably few insects that are so persistently injurious to spring wheat in Manitoba as this. Damage is done by it every year and occasionally to such a large extent as to cause extensive depredations amounting in some instances to twenty per cent. Whole fields will have a patchy appearance as if the grain had failed to germinate properly. An observant person, however, will at once detect the withered plants showing, perhaps a single green leaf remaining, while others will be entirely killed. When dug up plants look as if they had been pinched or chewed near the roots.

The flies appear in the early spring when plants have made but one or two leaves. Eggs seem to be laid singly or occasionally in pairs close to the ground and the larvæ after hatching, at once work their way downwards below the ground where they remain. There is another generation in June and perhaps yet another in late autumn attacking volunteer wheat and some of the grasses, though I was unable to secure flies by sweeping after June. Adults were reared from wheat gathered on May 17, appearing June 12 and for several days later. They were also collected from native grasses, particularly from genus *Agropyron* and from the now extensively cultivated grass, *Agropyron tenerum*.

Injury to grain in some cases amounted to five per cent but usually was much less. Late sown wheat seems to be freer from attack.

Western Wheat-stem Sawfly, *Cephus occidentalis*.—This species was again troublesome but not quite so much as in 1910. The first adults were observed on June 16. Fields next to last season's crop occasionally suffered on the edges to some 40% but the damage did not extend into them for more than a couple of hundred feet and became less severe towards the centre. These sawflies still appear remarkably free from parasites.

Grasshoppers or Locusts.—As was anticipated a rather severe outbreak occurred during the year, resulting in a few instances in considerable injury but as a rule the poisoned horse droppings were sufficient to keep them in check. They commenced to appear, as usual, early in May, but were retarded somewhat by cool weather. On July 10 the well-known fungus disease, *Empusa grylli*, broke out among them and continued to spread so that by the first of August as many as a dozen dead locusts could be counted in a square yard and often two or three upon a single weed. The disease, however, was by no means evenly distributed. It continued intermittently until October, by which time most of the locusts had died off. Several parasites were also at work, particularly a tachina fly, while the common prairie blister beetle, *Epicauta sericea*, was exceptionally numerous. There were also vast numbers of red mites—*Trombidium*—present which in August became so plentiful as to leave very few locusts free of them.

An examination for eggs shows a considerable decrease in their numbers in comparison with last season, with an unusually large proportion of them destroyed. They are, however, still in sufficient numbers to cause trouble provided no farther damage is done to them.

During the season some experiments were tried with sawdust as a substitute for horse droppings which proved, on the whole, successful. It was not supposed that this substance would replace horse droppings, but when the latter are not easily procurable it will, I believe, prove equally satisfactory to bran with the advantage of being cheaper. It requires, however, a larger quantity of salt to make it attractive but has the advantage of being easily spread finely so that there should be no risk of poisoning stock when it is placed correctly.

Insects Injurious to Roots and Vegetables

Imported Cabbage Worm, *Pontia rapæ*.—This butterfly is again on the increase. It was observed to be particularly numerous in the neighborhood of Stinkweed, *Thlaspi arvense*, upon which it feeds extensively.

Colorado Potato Beetle, *Leptinotarsa 10-lineata*.—Surpassed even last year's high record for numbers and took advantage of early lack

attention. Considerable injury was done by it to potatoes, and several garden plants were attacked, including *Nicandra physaloides* and *Nicotiana affinis*.

Turnip Beetle, *Entomoscelis adonidis*.—Very prevalent in June upon small wallflower, *Erysimum parviflorum*, which is its native food plant. Later it became quite rare and was only present in small numbers upon turnips in the fall.

Peppergrass Beetle, *Galeruca externa*.—This insect was enormously abundant wherever its chief food plant occurred. During May larvæ were found covering the ground in patches of several feet in circumference and plants of *Lepidium* were so badly infested that in places where they prevailed to the exclusion of other plants, large patches of half an acre or more were completely stripped bare and killed. Besides these all other species of *Cruciferæ* were attacked especially the genus *Arabis*, but farm crops escaped with slight injury due no doubt, to their scarcity in the family of plants usually eaten.

Miscellaneous

Among insects not so directly affecting agriculture, that were common during the year, the following are worthy of being recorded:

Willow-leaf Beetle. *Galerucella decora*. This beetle appeared suddenly on the 31st of May from unknown breeding grounds and at once proceeded to attack Aspen poplars which by the evening in certain spots, were actually bent down with the weight of beetles upon them and from a short distance whole bushes had a spotty grey appearance. The insects seemed to have congregated in certain places so that every tree covering an area of several acres would be infested, while the surrounding country remained comparatively free, edges of bushes were more attacked than centers and the sunny sides more so than shady ones.

Within twenty-four hours most of the leaves within the infested areas had been skeletonized, causing them to shrivel up and turn a dirty brown color. Willows also suffered severely, eventually more so than the poplars because it is upon them that the insects breed. This became abundantly manifest later in the season when the willows becoming completely stripped many of the larvæ died from starvation and but a moderate proportion reached maturity.

June Beetles *Lachnosterna* sp. including *rugosa*, *dubia* and *grandis* as determined by Doctor Glasgow, did considerable injury by eating the leaves of several trees and shrubs, but the larvæ were less numerous than usual and so caused little trouble.

Another leaf eater observed here for the first time was the Larch Sawfly. Though from the fact that even isolated trees, far removed

from others, were stripped, there is reason for suspecting that they must have been present the previous summer.

Plant lice of many species were also unusually prevalent during the early part of the season but later became greatly reduced through their usual predaceous and parasitical enemies.

From a stockman's point of view an interesting event was an extensive outbreak of the well-known fungous disease, *Empusa muscæ*, during June and early July. Strangely enough only the smaller flies were attacked, but these included the Hornfly which was so severely infected that it was of little annoyance to cattle, though promising a severe outbreak early in the season.

I may mention here that careful observations with both this and the locust fungus have led me to believe that cold—with possibly lack of sunlight, is the chief factor in the encouragement of these diseases, and that wet "muggy" weather has little to do with their spread. A moment's thought will bring to mind the fact that there is but one period of the year when *Empusa muscæ* is nearly always present, namely late autumn when the temperature is becoming low. In 1911 low temperatures were invariably followed by an increased number of deaths from *E. grylli* and so it was with *E. muscæ* and flies.[1]

Among other troublesome insects may be mentioned an unusually severe outbreak of mosquitoes covering most of the province, also an abnormal number of stable flies, *Stomoxys calcitrans*, and Horse bot flies, *Gastrophilus equi*.

THE COTTON SQUARE-WEEVIL OF PERU AND ITS PARASITES

By Charles H. T. Townsend, *Piura, Peru*

At the 1910 meeting of the Association of Economic Entomologists, a paper by the writer was presented announcing the discovery of this new cotton pest of the boll-weevil class and giving such notes upon it as had been possible of accumulation within two months after first making its acquaintance. The article appeared in the April, 1911, issue of the Journal of Economic Entomology. The present article gives fuller information concerning it and its parasites, being such additional facts as have come to light during the past year.

Mr. W. Dwight Pierce has examined specimens of the weevil and states that it may be called *Anthonomus vestitus*, the description by

[1] I am indebted to Mr. H. T. Güssow, Dominion Botanist, for the determination of both these fungi.

Boheman agreeing quite perfectly with weathered female specimens. He is about to publish full descriptions of both the adult and pupa under this name. He states that it belongs to a group not represented in North America.

It has developed as practically certain that the square-weevil reached the cotton districts of the Peruvian coast from the humid coast region of Ecuador. This clinches the comparative certainty of its being the same species that Boheman named *vestitus* from the Island of Puná in the Bay of Guayaquil. Wild cotton from the vicinity of Guayaquil has been examined and found to show evidence of the weevil in the presence of the peculiar cells which it makes within the buds. Cotton squares from the coast region of central Peru, in the Chancay valley, have revealed the grub of the weevil. Thus the species appears to be spread all along the coast of Ecuador and Peru where cotton occurs.

On the other hand it does not appear to occur in the mountains nor on the other side of the Andes in the montaña. During a trip into the montaña of the Province of Jaen, immediately east of Piura, in September, 1911, I was unable to find either the weevil in any stage or any sign of it in the cotton of that region, wild or cultivated. The scattered cotton plants seen were extremely clean of all pests, revealing no sign of either weevil or scale. Thus the square-weevil does not seem to inhabit other than the lowlands of the Pacific coast strip, in this part of South America at least. It is certainly a humid tropical species, as evidenced by its almost complete cessation of activity during the hot dry season. Nevertheless it maintains itself well here, resuming activity promptly on the advent of the humid months, though these mean nothing more than an atmospheric humidity during night and morning with cloudy weather usually for the greater part of the forenoon during which the humidity continues. The afternoons are almost invariably sunny, and the sun quickly disperses the humidity of the air.

During the present year the weevil has been found to a limited extent in the newly-set bolls, just after the dropping of the flower, but of 1971 such bolls collected in July and August, 1911, from various points over the whole cotton area of Piura Department, there issued or were extracted 178 weevils and 18 parasites. Subsequent examination showed 220 of the bolls to have been infested, indicating issuance of weevils from some of them prior to collection. These were all newly-set bolls that had either dropped or were yellowed and about to drop, or were dried and still hanging, and formed some 15 separate lots. In one case three adult weevils were taken from one of these small newly-set bolls. A half dozen or so infested fresh bolls of this

kind, from which were taken larvæ in the field, are not included in the count. Not a single case of infestation of any larger bolls has been found. It is probable that these newly-set bolls were infested just before the opening of the flower. After the flower is shed and the boll begins to grow, it is not affected by the weevil.

In July and August of the present year 4408 squares were collected from various points in the whole area at various dates, making 20 separate lots. These were fallen squares, and hanging squares that were either dead or more or less yellowed or opened indicating work of the weevil. From these were secured exactly 2800 weevils and 573 parasites. Most of these issued naturally, but all the squares were later opened and unissued weevils and parasites extracted. There was found to be a total of 2131 squares that had contained weevil stages. The other squares had doubtless been largely killed by the feeding punctures of the weevil.

The parasitism of weevil stages in the squares indicated by the above figures is practically 17%, being slightly short of it. That indicated in the newly-set bolls is over 9%.

The total of 591 parasites from the July and August, 1911, lots appears to represent at least 11 species, all of which I believe to be true parasites of the weevil. They are as follows, in the order of their comparative abundance:

(1) Sigalphus n. sp. (det. Viereck)—439 specimens. Ten of these averaged very much smaller than the rest and further differed in having much darker legs, but they are probably only a variation. This, as will be seen, is by far the most abundant parasite. The rearing records indicate a period of not less than 23–26 days, and 18–21 days for the small form.

(2) Bracon n. sp. (det. Viereck)—71 specimens. Two of these were extremely small, being only one and one-half millimeters in length, but I could see no structural nor even colorational differences in them. The rearing record is evidently valueless here, indicating not less than 11–13 days.

(3) Cerambycobius n. sp. (det. Crawford)—42 specimens, 33 being female and 9 male. Stated by Mr. Crawford to resemble closely *cushmani*, but differing in the sculpture of the mesonotum. Rearing records indicate not less than 17–29 days for the females, and 18–2 days for the males.

(4) Catolaccus n. sp. (det. Crawford)—13 specimens. Rearing records indicate not less than 10–14 days, which is evidently too short.

(5) Eurytoma n. sp. (det. Crawford)—9 specimens.

(6) Braconid—5 specimens. This is a large and elongate species

wholly brownish-yellow in color, including all parts. It was reared from four different lots, and though very large for the weevil is, I believe, an occasional parasite of it. (795° 3g)

7 Braconid—4 specimens. This was reared from two lots secured from widely separated points on the same estate. It resembles the Sigalphus sp. at first sight, but has swollen hind tibiæ, a wide and heavy-set head, and the antennal scape is swollen and elongate. The legs are mostly light reddish, but barred with light brown. It is very active, and unlike the Sigalphus can jump completely out from the bottom of a 25 x 100 mm. glass tube in one jump. It is remarkable for not appearing until long after all the other parasites as well as the weevils have ceased issuing. Rearing records indicate not less than 31 35 days. (795° 3q)

8 Braconid 3 specimens. This is an elongate and rather large blackish species, with brownish-yellow legs and antennæ, and very black conspicuous stigmal area in the forewing. The hind femora are brown. (795° 3h)

9 Encyrtinæ Gen. Nov.? (det. Crawford) 2 specimens. Mr. Crawford thinks this a doubtful weevil parasite. One came from a lot of newly-set bolls from the Rio Chira, and the other from squares from the Rio Piura.

10 Braconid—2 specimens. This is a small slender pale-colored form. The abdomen is pale yellow with a brown dot on each side of each segment, and the thorax has a pale brownish tinge. Stigma pale. The specimens are from two lots. (795° 3o)

11 Braconid 1 specimen from newly-set bolls. This looks much at first sight like the Bracon sp., but is extremely active and distinguished at once by this peculiarity. Head and thorax brown or blackish. Abdomen pale green with terminal one-half of tergum brown, rest of tergum shaded with brown. Legs and antennæ reddish-yellow. Ovipositor reddish, the sheaths dark. (795° 3u)

It should be stated that the rearing-record periods could be taken only from the last-issuing individuals of the lots. In some cases the parasites may not have found their way into the tubes promptly upon issuing. Moreover the conditions were not strictly normal.

The similar rearing-record periods for the weevil were 24 31 days, and these seem about right for that time of the year—July and August, the coolest months.

Finally it may be noted that the talented Italian, Raimondi, who spent 19 years of the last century in traveling over and investigating the natural resources of nearly every corner of Peru, cites in his great work "El Peru," vol. 2, page 278, the visit of D. Jorge Juan and D.

Antonio de Ulloa to Piura in the year 1740, mentioning the cultivation of cotton in the small fields here at that time. This shows that cotton has been cultivated more or less in the Department of Piura for centuries, but only on a small scale until 1864. Thus there is no telling how long ago the weevil found its way from the humid Ecuadorian coast region into the semi-arid districts of Piura and the coast strip of Peru farther south.

THE WORK IN PERU AGAINST THE WHITE SCALE OF COTTON

By Charles H. T. Townsend, *Piura, Peru*

Hemichionaspis minor, commonly known in Peru as the piojo blanco, has within a few years past developed into a serious pest of cotton in the Department of Piura in northwestern Peru. This insect if we include its close allies, is nearly tropicopolitan and its country of origin is a matter of much doubt. Whatever country may have been its original home, it is now quite certain that, like the square-weevil, it reached Peru from the humid coast region of Ecuador, where it occurs on wild cotton at the present time.

It was first noted in Peru in May, 1905, on cotton in the valley of the Rio Piura for a couple of miles along the river in the immediate neighborhood of the town of Piura, notably at Cocomba and Miraflores. It was not noted in the Rio Chira valley to the north of Piura until the second year following, in 1907, and did not reach Somate in the upper limits of the large cotton districts of the Chira until 1908.

At the time of my arrival in Peru, in November, 1909, it was well distributed throughout the large cotton haciendas of the Rio Chira and those of the upper half of the Rio Piura, but had not spread farther south in the latter than the vicinity of Casa Grande. In February, 1910, it was first noted at Santa Clara just to the south of the last-named point, and during that year it appeared scatteringly throughout the lower Piura valley, reaching the vicinity of Sechura which is near the sea. The present year it has appeared quite uniformly throughout this newly invaded district, and thus now holds the entire cotton region of Piura Department in force. It is yet unknown in the cotton districts farther south in Peru.

In this part of Peru, namely the northern coast region, the wind blows always from the south and is usually strong and long-continued. The scale has been spread through the Chira and Piura districts by two agencies acting in contrary directions. The winds have carried it northward up the rivers. The waters of the two rivers, flowing

south and west and used in irrigation, have carried it in general southward especially in the Piura valley, this in direct opposition to the prevailing strong winds. Its late invasion of the lower Piura valley is thus explained.

The species is recorded in the Fernald catalogue from New Zealand, Japan, Ceylon, Brazil, Grenada, Antigua, Jamaica, Panama, Florida, and a variety from West Africa. Mr. W. W. Froggatt writes me that the locality New Zealand is probably in error, and that Maskell's material probably came from some of the Pacific islands. To the above localities can be added Hawaii (Ehrhorn), Barbados (Ballou), Trinidad (Urich), Ecuador and Peru. The insect affects a great variety of plants. To those already recorded I can add probably twenty observed in Peru, but these are immaterial since the species is practically a general feeder as regards host-plants.

Some authors believe that *H. aspidistra* is the same as the present species, but I believe with Mr. E. Ernest Green that the two are distinct and can be easily separated in practically all cases. I have *aspidistra* from Cape Colony (Lounsbury), and Ceylon (Green). I also have *H. minor* from Ceylon (Green) and find the two forms easily separable on external puparial characters which are supported by the pygidial structure.

Both Japan and Africa have been suggested by authorities as the native home of *H. minor*. Professor Cockerell states that Hemichionaspis is a genus of the Old World tropics, with a lot of closely related species. *H. minor* is thus most probably not of American origin. As supporting this view I can state that I have uniformly found it absent from the montaña region on the east slopes of the Andes, on four trips that I have made in southern, central and northern Peru, and southern Ecuador.

The species evidently entered the Piura region at the port of Payta, where I found it abundant on various plants in November, 1909, and heavily parasitized. There are frequent steamer connection and exchange of commodities between Guayaquil and Payta, and the small intermediate ports of Tumbes, Zorritos, Talara and Negritos. The scale occurs at practically all of them. The distance from Payta to Guayaquil is 221 miles. From Payta the scale was probably carried direct, in shipments by rail, to Sullana in the middle Chira valley and Piura in the Piura valley, at both of which points it entered the small cotton fields and cotton patches near by, thus gaining a foothold. We may therefore consider the pest of Old World origin, long ago spread to America, and recently brought into northern Peru from the humid coast region of Ecuador.

Like most diaspine coccids this insect, if left to itself, is able to

breed quite continuously under practically all kinds of climatic conditions from cool humid to hot arid. The only requisite is that its host-plant shall continue in a condition of normal physiological activity. From this fact much interest, both from a bionomic and from an economic standpoint, attaches to the recent spread of the insect into the coast region of northern Peru.

The climatic conditions of Piura Department are practically unique. Situated about 5° south of the equator and practically at sea level, it partakes of few conditions that may be considered even tropical not to say equatorial. Probably no other region on earth is similarly influenced as to climate. So far as rainfall is concerned it is highly arid, being practically rainless, but during at least six months of the year June to November its atmosphere is largely charged with humidity. From the latter part of December to the first part of May it is a truly arid and extremely hot region, comparable during these months with the summer season of Sonora, Sinaloa and the Gulf Coast of Lower California. These conditions are due to the trade-winds which sweep tropical South America in a general westerly direction, to the peculiar configuration of the Andes south of the equator which deflects these winds upward, and to the northward-flowing cold Humboldt ocean-current from the Antarctic region which hugs the west coast of South America until near the equator and sends over the Peruvian coast region an unvarying south wind cold by comparison in the humid months but tempered by the fierce heat of summer.

H. minor, having gained access to this region with its peculiar climatic conditions, either brought with it or was met here by certain microhymenopterous parasites common to diaspine scales in tropical and subtropical countries and by some especially American. These parasites are practically confined to the now nearly cosmopolitan *Aspidiotiphagus citrinus*, *Prospaltella aurantii* and apparently *P. berlesei*, *Aphelinus fuscipennis*, and two or three if not more species of the tropical American genus Signiphora. These parasites are very active during the humid months, but unlike the host are unable to continue high activity during the hot dry months of summer. The dry and excessive heat of December and January sends most of them into a state of what I shall term aridation, in contradistinction to æstivation which takes place during the dry season in humid climates but under conditions of considerable atmospheric humidity. The host, being furnished with a never-failing food-supply in the ever-active cotton plant of this region, which affords it moisture internally and externally protected as it is from outside conditions by an impervious scale, is not similarly affected by the change to hot and dry conditions but continues as active as before.

The parasites just mentioned are able to dominate the scale by the end of the humid season, aided by other agencies to be described shortly. They resume activity in May and June and increase steadily during the ensuing humid months. As a rule in October and November very little living scale is to be found on the cotton plants, a very great part being parasitized, even up to 95 and 98 per cent in spots. But not all the scales succumb to the parasites and allied agencies, and here lies the flaw in ordinary parasite and natural enemy work against coccids in this region. The very few scales that escape, being relieved from the activity of their enemies, multiply in ever-increasing ratio from December to May, until the plague has assumed practically the same proportions as before. Thus the parasites and other enemies have lost all they gained, have all their work to repeat, and the scale has been present in damaging force for half the year.

It may be stated here that spraying and all kinds of insecticidal operations are practically out of the question in the cotton fields of Peru, not only on account of the large extent of the plantations making the total cost of treatment exorbitant and the present impossibility of securing concerted action, but also particularly because of the methods of cultivation and irrigation in vogue, which are peculiarly well suited to the prevailing conditions and could only with the greatest difficulty be changed and which do not allow the use of work-animals and machinery in the fields. Moreover work-animals are not to be had, at least for the present, and all cultural and insecticide work would have to be performed by hand-labor, which is scarce. Thus the only feasible mode of procedure against the scale for the present lies in parasite, coccinellid or other natural-enemy work.

Cutting back once a year would greatly reduce the seriousness of the pest, but the favorite native Peruvian and perennial variety of cotton is not amenable to this practice. Annual planting would similarly reduce the injury, but greatly increase the cost of production. Moreover both conflict with the season of irrigation in the Piura valley, which is without flowing surface water for half the year, and with the established cropping seasons in the whole region. Neither would greatly reduce the pest, which flourishes in especial abundance on willows, castor-bean plants, pigeon-pea, beans, and many others, all of which would need similar treatment. All of these and still other conditions emphasize the natural-enemy plan of work as the most tenable mode of procedure.

It must now be noted that no doubt a considerable part of the nearly complete mortality of the scale at the close of the humid season is due to natural physiological causes inherent in the host and not

all to the parasites and enemies. In other words practically all of the adult scales that have not succumbed to the enemies die naturally after having performed their function of reproduction. But the fact remains that but a very small percentage of young escape at this time, and this result is evidently due to the activity of the parasites and other natural enemies.

The enemies of the scale so far at work here, other than hymenopterous parasites, are chiefly coccinellids, mites and fungi. A small black scymnid belonging either to Microweisia or to a closely allied genus is abundant in both the larval and the adult stages feeding upon the scale over the whole region. The mites are so far problematical in their influence, since it is likely that they feed chiefly on the dead scales. A species of the fungoid genus Sporotrichum quite extensively attacks the scale, but probably mostly the older and already spent individuals. The larvae of the cecidomyid genus Lestodiplosis and the lepidopterous genus Blastobasis have been reared in extremely small numbers from the scale, and have no present effect upon it. Practically all of these enemies, whether of value or not, conform to the same custom as the parasites and become largely if not wholly inactive during the hot dry season.

The establishment here of the oriental *Chilocorus similis* has been attempted, three sendings having so far been kindly shipped from Japan by the Imperial entomologist, Mr. S. I. Kuwana. The few individuals that survived the voyage uniformly failed to withstand the hot season here. While this and other foreign coccinellids would probably not continue active here during the hot months, they would certainly be able to flourish during the humid months and would aid in the decrease of the scale.

As to the habits of the parasites and enemies now at work here, it may be said that we evidently have in them, for the period of their activity during the humid season, as nearly a complete chain of attack or sequence of enemies as is possible of attainment with a host of this nature. The scymnid Microweisia (or nearly allied genus) attacks the eggs as well as the young and adults. Aspidiotiphagus parasitizes the newly-hatched young while they are still active and up to the time that they become fixed. Aphelinus evidently parasitizes the adults and the early stages after they have become fixed and exerted the scale-covering. Prospaltella probably has the same habit as the last, at least *P. aurantii* from its large size, while it is probable from their small size that the species of Signiphora may have a similar habit to that of Aspidiotiphagus. It further seems likely that the last-named genus at least is parthenogenetic. All the-

points will be fully investigated as soon as the proper facilities can be had for carrying out the work.

The oviposition of Aspidiotiphagus may be described here, as I think it has not before been observed. Tilting a pill-box cover bearing on the inside surface both the Apidiotiphagus and the active Hemiberlesinaspis larvæ so that I could see the underside of the body of the former, I was able to witness every stage in the act clearly and repeatedly with the 65x magnification of the binocular. The parasite approaches an active larva and strokes it with her antennæ to quiet it and to determine the position of its head apparently. If on approaching it she happens to be facing its head, I noted in several cases that she turned so as to face the same way as the larva before advancing to place the latter immediately under her abdomen with her feet on each side of it. By this means she can tell whether the larva moves during the act. The larva usually remain motionless, apparently soothed by the preliminary antennal stroking into receiving the insertion of the parasite's ovipositor. I noted in one instance that the parasite attempted to insert the ovipositor into a larva that happened to face in the opposite direction from herself, not having taken the precaution to turn around before advancing to cover it, whereupon the larva ran out between her hind legs and the ovipositor slipped to the surface of the box cover, into which the parasite, unconscious apparently of the escape of the larva, endeavored to force it. The Aspidiotiphagus, being in position for the act, brings the tip of the ovipositor with the tips of the two lateral ovipositor-guides to the dorsal surface of the larva, usually about the center of the dorsum, the guides being held in that position for a moment or two until the point of the ovipositor has effected an entrance when they are allowed to return to place approximated to the ventral surface of the abdomen, and the ovipositor is seen to remain as a minute long bristle stuck into the body of the larva. It remains inserted in the larva's dorsum but a few moments, evidently long enough only for the passage of a single egg. The parasite then proceeds to find another larva, when the operation is repeated.

The habit which Aspidiotiphagus and probably certain other of these smaller parasites have of ovipositing in the active coccid larvæ has an important bearing on the spread of the parasite species concerned. As the active larval period is the only one during which these coccids become dispersed from plant to plant, the advance of the host assures the transportation of the parasite provided the latter is sufficiently numerous at the origin of spread.

Concerning other parasites available for the work here, the following records of rearings from *H. minor* may be made:

Barbados—From material sent by Mr. Ballou through the courtesy of the Honourable Commissioner of Agriculture for the West Indies I have reared *Arrhenophagus* sp., *Azotus* sp., and *Signiphora* sp., besides *Aspidiotiphagus citrinus* and *Aphelinus fuscipennis*. The Signiphora seems the same as the Peruvian species that I reared at Lima, and which has recently been found at work on the scale here probably as the result of our introductions.

Ceylon—Material sent by Mr. E. Ernest Green furnished an abundance of *Prospaltella berlesei*, and some *Aphelinus diaspidis*.

Hawaii—Material from Mr. Edward M. Ehrhorn furnished *Aspidiotiphagus citrinus*, and what is probably *Aphelinus mytilaspidis*.

Trinidad—Material from Mr. F. W. Urich showed only *Aspidiotiphagus citrinus*.

Practically all of the determinations of parasites mentioned in this paper were made by Dr. L. O. Howard, whose kind assistance I here acknowledge.

Several other parasites have been reared from lots of the scale in Piura, but they are of rare occurrence and have not yet been positively connected with the host. Some are mymarids and probably egg-parasites, and others may have come from weevil larvae within the cotton stalks bearing the scale. They need further investigation. A host of species of micro-hymenopterous parasites occurs throughout Peru, many of which may be made use of to fight the scale. Many lots of various scales containing such parasites have been used as vehicles and brought from Lima for the liberation of the parasites here. Others have been brought from the United States, Barbados and Japan, through the courtesy of the respective official entomologists of those countries, and the parasites liberated here. Only the Barbados shipment consisted of *H. minor* as a vehicle, the Japanese and United States shipments using *Diaspis pentagona*. The Lima shipments used various species of Diaspis and close allies. These have to some extent borne fruit. In addition systematic shipments of parasite material using *H. minor* as a vehicle have been made for two seasons between different points in the whole region of the Piura and Chira valleys, for the purpose of distributing the various species of parasites as evenly as possible over the whole area. With all these facts borne in mind, it needs to be emphasized that all our varied resources in this line appear as yet to be quite confined to the possibilities of the humid season alone.

It remains now to make the final statement of the outlook. Evidently we need here an enemy of the scale that will persist in a state of high activity during the hot and dry season. Such enemy is not yet in sight. But it would seem probable that the sunburned ex-

tents of Sonora, Sinaloa and the Gulf Coast of Lower California should hold such an insect, if not several of them. Large extents of that region are almost rainless and possess a very low average of atmospheric humidity. Coccids abound there and there certainly should their enemies abound as well. Parasites and coccinellids adapted to the driest and hottest parts of that region should be able to continue active through the hot dry season of the Peruvian coast region. Lower California, known as a land of drought and desert, offers the most promise of all in this respect in its Gulf coast region near the middle of the peninsula. This part receives the least rainfall of the whole region above outlined, has the least atmospheric humidity, and is evidently the hottest throughout the year. It is probable that an effort will be made to investigate this region in the hope of securing the requisite agency for use against *Homichionaspis minor* in Peru.

TOBACCO EXTRACTS, THEIR COMPARATIVE VALUES AS INSECTICIDES

By W. O. Hollister, *Research Laboratory, Parke, Davis & Co., Detroit, Mich.*

The use of tobacco as an insecticide is recommended in the earliest available literature on the subject. It, therefore, bears the unique distinction of being not only one of the oldest of insecticides, but one most frequently used at the present time for a certain class of insects. Just when it was first used is not known, although several of the early writers refer to it in their papers on remedies for insects.

The first available report of its use was in 1763 when it was recommended in France as a remedy for plant lice. Both tobacco water and tobacco powder were used at that time. The first mention of its use in America was in 1814 by Yates of Albany, who applied tobacco water for sucking insects. William Corbett in the English Gardener, 1829, recommended tobacco juice for woolly aphis and Thomas Fessenden in the New American Gardener, 1832, included tobacco in a list of materials which he stated "may annoy or completely destroy insects."

Doctor Riley in 1884, said that the three most valuable insecticides of general application in use during the early days of economic entomology, and up to within a few years, were tobacco, white hellebore and soap.

It is very evident that tobacco is an old time remedy and its use at the present day for the eradication of a certain class of insects is indispensable. During the early use of tobacco it was employed for all sorts of insects, one writer only a short time ago reported that a decoc-

tion made by steeping 5 grms. of smoking tobacco in 15 cc. of water was fairly successful against scale insects. Tobacco water and tobacco smoke have long been employed against aphids and other delicate insects wherever the vapors can be confined, as in a greenhouse. Burning of tobacco in such enclosures is as effective and often less injurious to the plants than the older methods of syringing a decoction or of fumigation by burning.

Tobacco, as an insecticide, may be used in several ways and forms: as (1) a liquid spray of a decoction made by soaking the stems, (2) a powder for dusting on plants, and (3) a fumigant, the fumes being produced by the burning of the stems or powder. To these might also be added the various commercial tobacco extracts and nicotine preparations now on the market, which may be used both as sprays and as vapors.

While there is no set rule or formula for making tobacco water or decoction, one pound of stems is generally used to one gallon of water. Warm water may be used, but never boiling, as the heat will volatilize some of the nicotine and the essential ingredient of the decoction would be lost. Tobacco water is sometimes mixed with soap or other materials, but it is generally used alone, being diluted according to the hardiness of the plants on which it is to be applied.

Chemically, tobacco is made up of many constituents, the most poisonous being nicotine. The word nicotine or Nicotiana, the genus to which tobacco belongs, was given to it in honor of John Nicot, who, in 1560, sent seeds to the king of France, describing them as the germs of a medicinal plant of great value. Different varieties of tobacco and the locality where it is grown affect the quantity of nicotine, plants grown on heavy moist soil possessing the highest percentage of the principle. The decoction varies in the amount of nicotine present, having a range of from .53 to 5.21 per cent (Shaw), depending not only upon the variety of the plant and locality in which it is grown, but also upon the method used in obtaining the extract. It is said that an addition of 10 per cent of lime to the water will more efficiently draw the nicotine from the stems.

Nicotine itself when pure is a colorless, volatile liquid which rapidly changes to a brown color when exposed to the air. There are several methods for extracting nicotine from tobacco. A relatively high temperature cannot be used in extraction or the nicotine will be lost. Some of the products now advertised are made from the pure nicotine, while others contain more or less of the other ingredients of the extract. It is claimed by some that the nicotine is the principal active constituent of a tobacco extract, while others hold that other ingredients add to its effectiveness as an insecticide.

To determine this, experiments have been carefully carried out by the writer with different nicotine preparations now on the market. These preparations contained percentages of nicotine which varied from 7 to 40 per cent. They also varied in weight, color and odor. As a check upon these, dilutions of pure nicotine were used, a solution containing 10 per cent nicotine.

The preparations were guaranteed to contain the following percentages of nicotine:

No. I..... 8 per cent.
No. II..... 25 per cent
No. III..... 30 per cent
No. IV..... 40 per cent
No. V (Check)..... 10 per cent
No. VI..... 7 per cent.

No. VI was nicotine sulphate made from pure nicotine combined with sulphuric acid.

As a test insect the common bedbug, *Cimex lectularius*, was used. The bedbug was used not to find a remedy for its extermination, but because it was easy to obtain and because of its resistance and tenacious hold upon life. A total of over sixteen hundred insects were used in the experiments.

The method of making the tests conform with that described in a paper on "A Contribution to Our Knowledge of Insecticides" which was read before the International Congress of Zoölogists at Boston in 1907. The insects were placed in glass tubes covered at the ends with cheese cloth, a thin cloth being used to allow the free passage of the liquid. With a hook fastened into the cloth the tube was quickly plunged into the solution. By rapid agitation the protective air globules, which surround the spiracles can be removed and the whole of the insect comes in contact with the insecticide. At the end of one minute the tube was withdrawn and the insects quickly removed to a dry paper and covered with a clock glass to prevent any lively ones from escaping. The first results were noted at the end of twenty-four hours. Bugs dipped in clear water for one minute recovered and became as lively as ever in a very short time. This proved that the insects dipped in the nicotine solution did not die from drowning.

Four different dilutions were made of the products tested, the solutions containing respectively .50, .75, 1 and 2 per cent of pure nicotine. Five fresh dilutions were made of each, using ten insects to a test and no insect or dilution was used twice.

The following results were noted at the end of the first twenty-four hours.

NICOTINE

Nicotine	.50 Per cent		.75 Per cent		1 Per cent		2 Per cent	
	Alive	Dead	Alive	Dead	Alive	Dead	Alive	Dead
No. I.	40	10	34	16	39	11	20	
No. II.	44	6	40	10	39	11	32	
No. III.	47	3	47	3	44	6	44	
No. IV.	33	17	24	26	16	34	12	
No. V.	46	4	40	10	39	11	27	
No. VI.	43	7			38	12	32	

Insects untreated were as lively as ever.

The final results noted five days later are as follows:

Nicotine	.50 Per cent		.75 Per cent		1 Per cent		2 Per cent	
	Alive	Dead	Alive	Dead	Alive	Dead	Alive	Dead
No. I.	18	32	12	28	8	42	6	
No. II.	22	28	20	30	6	44	2	
No. III.	26	24	20	30	4	46	1	
No. IV.	18	32	8	42	1	49	0	
No. V.	25	25	18	32	8	42	0	
No. VI.	30	20			17	33	3	

RESULTS EXPRESSED IN PERCENTAGE

Nicotine	.50 Per cent	.75 Per cent	1 Per cent	2 Per cent
No. I. Per cent dead	64	76	84	
No. II. Per cent dead	56	60	88	
No. III. Per cent dead	48	60	92	
No. IV. Per cent dead	64	84	98	
No. V. Per cent dead	50	84	84	
No. VI. Per cent dead	40		66	

As seen from the above the different products vary but little in their final results, although No. IV, a thick heavy preparation containing a large percentage of the tobacco extract, shows more dead at the first observation and a slightly higher percentage of killed insects at the termination of the experiment. This difference, however, is not great enough to recommend such a product over others having the same percentage of nicotine. Pure nicotine (No. V) appears

is as efficient as the first four preparations and possesses a slight advantage over the sulphate, No. VI. Thus it would appear that any advantage gained by making a sulphate would be lost by its becoming less efficient as an insecticide.

Experiments with a pure nicotine product and one containing more or less of the tobacco extract show that the pure nicotine solution has several advantages over the latter preparation. The pure solution is much cleaner to handle, less distasteful to use and will not stain clothing or anything with which it may come in contact. Delicate flowers may be sprayed with such a preparation with no discoloration of the petals.

The manner in which nicotine kills an insect is not known. G. Del Guercio of the Experiment Station at Florence, Italy, believes that the solution of nicotine acts poisonously upon insects by means of vapors and that these vapors, even in minute quantities, cause irritation, convulsive movements and, if sufficiently increased, death to the insect. It is evident from spraying experiments that nicotine very quickly causes death to those insects having soft and delicate bodies while the harder stronger insects show no detrimental effects. Knowing the burning sensation which a small amount of nicotine solution will cause when taken into the mouth, it is easy to imagine the effect upon the soft-bodied insect.

Summary

1. It may be safely stated that the use of tobacco, one of the oldest insecticides, is becoming more popular as a destroyer of insects, contrary to the fate of a large number of the insecticides of early origin.

2. A solution of pure nicotine is practically as efficient as the products containing a quantity of extractive matter.

3. Nicotine sulphate possesses no advantage over the uncombined product.

4. A solution of pure nicotine possesses the additional advantage of being free from the other constituents of tobacco which are nauseous and injurious.

[This completes the Proceedings.—Ed.]

ERRATA

Inadvertently the numerals 17 and 18 were omitted in numbering the plates in Volume 4—the sequence jumping from 16 to 19. The references to plate 17 on pages 425 and 429 relate to the plate numbered 19.

AN ANNOTATED LIST OF THE LITERATURE ON INSECTS AND DISEASE FOR THE YEAR 1911

By R. W. Doane, *Stanford University*

During the year 1911 important advances were made in our knowledge of the relation of insects to disease. As during the past few years, most interest has centered around the studies in regard to Sleeping Sickness.

Several of the papers and reports give much additional information in regard to the bionomics of the tsetse flies, their haunts, habits and relation to man and other animals. It is now known that some of the vertebrates other than man may harbor *Trypanosma gambiense* and that there is a possibility of these being transmitted to man.

Certain experiments have shown that *Glossina morsitans* may act as a host for a human trypanosome which is probably identical with *T. gambiense*. This seems to account for many of the cases of Sleeping Sickness in regions where *G. palpalis* does not occur and indicates that the disease may spread over yet wider areas.

An interesting account of the development of *T. gambiense* in *G. palpalis* is given in one of the reports of the Sleeping Sickness Commission. Two days after biting an infected animal the fly becomes incapable of infecting other animals and remains so for about 22 to 28 days when it again becomes infective and may remain so for at least 96 days. During the infection period the salivary glands are found to be invaded with the type of the trypanosome that is found in the vertebrate blood.

The *Journal of Tropical Medicine and Hygiene*, November 1, 1911, announces that a new commission has been appointed to study Sleeping Sickness in Nyassaland where *G. palpalis* has not been found. It is hoped to determine whether the parasite that causes the disease is distinct from *T. gambiense* or whether other species of tsetse flies may transmit this parasite.

The recent outbreak of pneumonic plague in Manchuria and North China has created world-wide interest. Although this type of plague is not dependent on fleas for its transmission, being directly contagious, it can usually be traced more or less directly to an outbreak of plague in some other animals. This outbreak originated in the tarabagan, a kind of squirrel in Manchuria and was spread over an extended region by the hunters who trapped these animals.

Cantlie, Jour. Trop. Med. & Hyg. Feb. 15, 1911, gives the following summary of the way in which plague may appear:

1. As a disease in animals.
2. Pestis minor, conveyed by infected insects.
3. Bubonic plague, sporadic cases, carried from animals to man by insects.
4. Epidemic bubonic plague carried from man to man by insects.
5. Pneumonic plague passing from man to man directly, or conveyed by insects.

The latter is regarded as the culmination and the most to be dreaded as it may pass over a region as the Black Death.

The Public Health Reports show that the work against the ground squirrels in California is being pushed vigorously and that infected squirrels are still being found. One death from plague occurred in California during the past year which was directly traceable to infection from the squirrels. Two other cases, both of which recovered, were also probably the results of squirrel infection.

October 23, 1911, press dispatches announced the arrival of another ship in Hawaii on which a yellow fever patient had died. Soon after this we read of Doctor Blue being sent to these islands and of the energetic fight that was begun to control the mosquitoes there. It is to be hoped that such warnings as these will be heeded by the inhabitants of these islands and that more determined efforts will be made to get rid of this constant and ever increasing source of danger.

Sir Robert Boyce's paper in regard to the prevalence and significance of the yellow fever mosquito in Africa has caused considerable discussion in the medical journals.

The appearance of Doctor Howard's book on the housefly and the reports of Graham-Smith and others given in the Reports of the Local Government Board for Great Britain are important additions to our literature in regard to the housefly and its relation to various diseases. Doctor Stiles' experiments showing the ability of the fly to issue even when the larvæ is buried under six feet of sand is certainly a strong argument against the effectiveness of the dry system of disposal of faces.

Late in the summer a second field commission for the investigation of pellagra was organized with Doctor Sambon at its head. He was joined by workers from several different countries and a study was made of the disease and the conditions surrounding it in Roumania, Hungary, Austria, Italy, Spain and France. The interim report which they have made seems to indicate that they found some evidence both for and against Sambon's theory that this disease is transmitted by Simulidæ.

The studies of Sanders and Long on the relation of insects to the transmission of Leprosy are of considerable interest as they both reach the conclusion that the bedbug may be an important factor in spreading the disease.

Studies on the relation of ticks to spotted fever have been directed mostly toward learning more about the distribution and biology of the so-called "Spotted fever tick." Mayer's work, however, seems to show that at least four other species are capable of transmitting the disease.

The appearance of part II of the "Monograph of the Ixodoidea" by Nuttall and co-workers was welcomed by all interested in this work. It is an exceedingly helpful and important work.

Wenyon's report on his studies on the Oriental Sore in Bagdad adds much to our knowledge of this disease and shows how some of the insects may play an important part in transmitting it.

We all read with pleasure the announcement of the bestowal of knighthood upon Major Ronald Ross. His important contributions to medicine, particularly his studies on malaria have placed him in the foremost ranks of the benefactors of mankind.

In June came the sad news of the death of Sir Robert Boyce. Boyce was one of the principal founders and organizers of the Liverpool School of Tropical Medicine and perhaps the foremost leader in the practical study and the fight against tropical diseases. He made a particular study of Yellow fever and published several papers and reports on his investigations. His "Mosquito or Man," 1909, and "Yellow Fever and Its Prevention," 1911, are his two most important books. He began the publication of the *Yellow Fever Bulletin* and was at work on the manuscript of the second number when he was suddenly taken ill. His death, which occurred two days later, was due to cerebral hemorrhage.

Surgeon-General Walter Wyman, who has done so much to build up the United States Public Health and Marine Hospital Service, died in Washington November 21, 1911. He had been in the service since 1876 and under his direction much has been accomplished for the betterment of the sailors' conditions and several notable and successful fights have been made against epidemics. With two of these, the fight against yellow fever in New Orleans and against plague in San Francisco, Dr. Rupert Blue was closely associated and it was a distinct pleasure to all interested in this work to learn that Doctor Blue was appointed to fill the important post left open by the death of Doctor Wyman.

The following list makes no claim to completeness but records such books and articles as I have noted in my reading. It contains but few of the Continental papers. It may be regarded as a second supplement to the bibliography given in my "Insects and Disease." The first supplemental list appeared in Vol. 4, No. 4 (1911) of this Journal.

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Bagshaw, A. G. Communication Relating to Some Recent Experiments on the Transmission of Sleeping Sickness. Brit. Med. Jour. Nov. 11, 1911, p. 1263. Refers to the experiment which seems to show that *Glossina morsitans* may transmit this disease.

Bagshaw, A. G. Recent Advances in Our Knowledge of Sleeping Sickness. Read before Soc. Trop. Med. Hyg. Oct. 23, 1911. Abs. in Jour. Trop. Med. & Hyg. XIV: 21, Nov. 1, 1911. Gives results of late studies and experiments.

Castellani, A. Remarks on the Possible Plurality of Species of the Trypanosomes Affecting Man in Africa. Jour. Trop. Med. and Hyg. XIV: 2, Jan. 16, 1911. Believes that *G. palpalis* may transmit more than one species of human trypanosomes and that these have been regarded as only one species.

Darling, S. T. Murrina, a Trypanosomal Disease of Equines in Panama. Jour of Infec. Diseases, Chicago, June, 1911. See also Parasitology June 1911. A disease similar to nagana, surra, etc., believed to be carried by flies mechanically to wounds.

Darling, S. T. The probable Mode of Infection and the Methods Used in Controlling an Outbreak of Equine Trypanosomiasis (Murrina) in the Panama Canal Zone. Parasit. IV: 2 June 1911. Same data as given in Jour. Infec. Diseases June, 1911.

Foy, H. A. A Third Report on Experimental Work on Animal Trypanosomiasis. Jour. Trop. Med. and Hyg. XIV: 20, Oct. 16, 1911. Work conducted in northern Nigeria. Gives list of flies and records of experiments.

Hindle, E. The Passage of Trypanosoma gambiense Through Mucous Membranes and Skin. Parasitology IV: 1, Mar. 1911. Discusses the possibility of this method of infection in man and records experiments with animals in which he obtained infection *per. os*, *per. vaginam*, and *per. cutaneam*.

Kleine, F. K. and **Fischer, O. W.** Die Rolle der Sangetiere bei der Verbreitung der Schlafkrankheit und Trypanosomenbefunde bei Sangetiern am Tanganjika. Zeit. f. Hyg. Infek. LXX pp. 1–23, 1911. (Abs. Sleep. Sick. Bur. Bull. 31 pp. 402–407 and 417–418) Sheep and goats shown to be susceptible to *Trypanosoma gambiense* and may serve as reservoirs. The usual life duration of the female *Glossina pallidipes* in captivity was found to be about 4 1-2 months.

Mohler, J. R. and **Thompson, W.** A Study of Surra Found in an Importation of Cattle, Followed by Prompt Eradication. 26th Annual Rept. of Bu. of Anim. Ind. for 1909 (pub. 1911) (Abs. in Sleep. Sick. Bu. Bull. 28, July, 1911). See also Sleep. Sick. Bu. Bull. 30, Oct. 1911, p. 366. Some imported cattle were found infected on arrival and others later. Author suggests that the latter may have become infected by horse flies or stable flies carrying the parasites.

Newstead, R. A Revision of the Tsetse Flies based on a Study of the Male Genital Armature. Bull. Ento. Research II, pt. 1, May 1911. Descriptions and figures, synopsis of the species.

Taute, M. Experimentelle Studien uber die Beziehungen der *Glossina morsitans* zur Schlafkrankheit. Zeit. of Hyg. and Inf. Oct. 1911. Abs. Sleep. Sick. Bu. B.T. 30. Records that the human trypanosome may be transmitted by *G. morsitans* and that these flies act as definite hosts for the parasite.

Thompson, J. D. Note on the Transmission of Trypanosomes. Sleep. Sick. Bu. B.T. No. 31, Nov. 1911. Gives evidence against mechanical transmission and points out that the human trypanosome may be transmitted by more than one species of fly.

The Sleeping Sickness Commission composed of David A. Bruce, E. A. Hamerton, H. R. Bateman, and F. P. Mackie, published the following papers in the Proc. Roy. Soc. series B, vol. 83, 1911:

Experiments to ascertain if antelope can act as a reservoir of the virus of sleeping sickness (*T. gambiense*) 564 pp. 311–327. Antelope easily infected and flies feeding on them pass the infection to other animals; none found infected in nature.

Experiments to ascertain if the domestic fowl of Uganda may act as a reservoir of the virus of sleeping sickness. 564 pp. 328–334. Results negative.

Experiments to investigate the infectivity of *Glossina palpalis* fed on sleeping sickness patients under treatment. 565 pp. 338–344. Treating patients with arsenic and other drugs did not keep the flies that fed on them from becoming infective.

Experiments to ascertain if *Trypanosoma gambiense* during its development within *Glossina palpalis* is infective. 565, pp. 345–348. Rev. in S. S. Bull. 26 p. 155. *T. gambiense* retains virulence for two days (ascertained by direct inoculation) lost then for 22 days. Salivary glands of the fly invaded by virulent forms 36 days after it had fed on infected blood, without this invasion of the salivary glands the fly does not become infective.

Further researches on the development of *Trypanosoma gambiense* in *Glossina palpalis*. 567, pp. 513–527. (Abs. in S. S. Bull. 28, also in Jour. Trop. Med. and Hyg. July 1, 1911.) The parasite undergoes a definite development in the fly: the salivary glands, but not the proboscis, becoming involved. After a very short time the flies which have been fed on an infected animal become incapable of conveying infection by their bites, and this non-infectivity lasts for some 28 days when a renewed infectivity takes place and remains for at least 96 days. At this time the salivary glands are invaded by the type of trypanosomes found in vertebrate blood.

Trypanosoma lewisi and Rat Fleas

Minchin, E. A. and Thomson, J. D. On the Occurrence of an Intracellular stage in the development of *Trypanosoma lewisi* in the Rat Flea. Brit. Med. Jour. Aug. 5, 1911. Account of the development that takes place in the epithelium of the stomach of the flea.

Minchin, E. A. and Thomson, J. D. The transmission of *Trypanosoma lewisi* by the Rat Flea. (*Ceratophyllus fasciatus*). Brit. Med. Jour. June 3, 1911, pp. 1309–1310. Authors refer to Strickland's paper in which he holds that the rats are infected by eating the fleas. Authors' experiments seem to show that this is the exceptional, not the usual means of infection, which is by the fleas feeding on rats and regurgitating the infective forms of the trypanosomes into the wound.

Strickland, C. The Mechanism of Transmission of *Trypanosoma lewisi* from rat to rat by the Rat Flea. Brit. Med. Jour. May 6, 1911, p. 1049. Infection caused by rats eating infective fleas not by their bites or otherwise.

Swellengrebel, N. H. and **Strickland, C.** Some remarks on Dr. Swingle's p... "The Transmission of *T. lewisi* by Rat-flea" etc. Parasit. June 1911. B... that Swingle has created an artificial life-cycle for *T. lewisi* in the flea.

Swingle, L. D. The Transmission of *Trypanosoma lewisi* by Rat Fleas (... *taphylus* sp. and *Pulex* sp.) with short descriptions of three new Herptomon... Jour. Infec. Diseases VIII No. 2 Mar. 1911, pp. 125–146. Shows that this tr... mission may take place.

Rats, Squirrels, Fleas and plague

Bashford, J. W. Stamping Out the Plague in China. Outlook 98: pp. 249–51. June 3, 1911.

Blue, R. Methods for the Control of Plague with Special Reference to Admin... trative Details. Jour. Amer. Med. Assn. LVII, No. 16, Oct. 14, 1911. Discuss... relation of rats, squirrels and fleas to the plague.

Blue, R.; **Heg, E. E.**; **Snow, W. F.** Report of Committee on Methods for th... Control of Plague. Jour. Amer. Med. Assn. LVII, No. 16, Oct. 14, 1911. Ex... mination of rodents and at least a squirrel free zone around all cities.

Cantlie, J. Plague in Manchuria and Its Lessons. Jour. Trop. Med. and Hyg. XIV: 4 Feb. 15, 1911. History of the outbreak. Plague may develop or appear in the following stages: (1) As a disease in animals. (2) Pestis minor conveyed by infected insects. (3) Bubonic plague, sporadic cases, carried from animal to man by insects. (4) Epidemic bubonic plague carried from man to man by insects. (5) Pneumonic plague passing from man to man directly, or conveyed by insects. The latter regarded as the culmination and the most to be dreaded as it may pass over a region as the Black Death.

Cantlie, J. Plague and Its Spread. Jour. Roy. Soc. of Arts. Mar. 10, 1911. History of Plague; different ways in which it may manifest itself, methods of spread and control, discussion by various doctors.

Chick, Harriette, and **Martin, C. F.** The fleas common on rats in different parts of the world and the readiness with which they bite man. Jour. of Hyg. Mar. 1911. XI: No. 1 p. 122. Lists and tables. No reason why *C. fasciatus* would not be as efficient an agent in transmitting plague as *X. cheopis.*

Cunningham, J. The Destruction of Fleas by Exposure to the Sun. Sci. Mem. Med. and Sanit. Depts. India, n. ser. 1911, No. 40. Fleas may be killed if exposed to the heat of the sun at a temperature of 116° or higher.

Gray, Douglas. Septicaemic and Pneumonic plague outbreak in Manchuria and North China. Lancet Apr. 29, 1911. (Summary in Jour. Trop. Med. and Hyg. May 15, 1911.) History of the outbreak which started among those who hunted the tarabagan, the animal susceptible to epizootic plague.

Harms, B. Zur Naturgeschichte der Flöhe Medizinssche Klinik, Berlin, A... 27. 1911. Biology and natural history of fleas and a trap in use in orient; ... smeared with sticky substance and inserted in bamboo stick with just enough ... the walls left to keep sticky substance from touching clothes. Traps pla... about beds or person.

Howard, L. O. House-fleas. Circular 108 Bu. of Ento. U. S. Dep. Agric. F... 11. 1911. Cat or dog flea most common in East; life-history, remedies.

Kawakami, K. K. Fighting the Plague in Manchuria. World Today 20: 711–... June, 1911. Points out difference between bubonic and pneumonic plague and ... methods of combatting each type.

Martin, C. J. The Spread of Plague. Jour. Trop. Med. and Hyg. XIV: 7... Sept. 1, 1911. Brit. Med. Jour. Nov. 11, 1911. Various types of plague and ... way in which each may be transmitted. Discussion by various doctors.

McCoy, G. W. The Susceptibility to Plague of the Weasel, the Chipmunk and the Pocket-gopher. Jour. Infec. Diseases VIII No. 1 Jan. 1911 pp. 42–46. Weasel (*Putorius xanthogenys*) and the chipmunk (*Callospermophilus chrysodeirus*) quite susceptible; gopher (*Thomomys bottæ*) slightly so.

McCoy, G. W. The Squirrel Plague Problem. Cal. State Jour. Med. Mar. 1911.

McCoy, G. W. Studies Upon Plague in Ground Squirrels. Pub. Health and Mar. Hosp. Bull. 43 p. 7–51. 1911. Discusses plague in squirrels and relation of fleas to same. The squirrel flea and the squirrel louse both harbor the plague germ when they feed on plague infected squirrels or guinea pigs or white rats and may transmit the disease from one of these animals to another.

McCoy, G. W. A Plague-like Disease of Rodents. Pub. Health and Mar. Hosp. Serv. U. S. Pub. Health Bull. 43, 1911 pp. 53–71. This disease is very similar to plague and may have been confused with it. In laboratory experiments it can be transmitted by fleas.

McCoy, G. W. Bubonic Plague with Special Reference to that of Ground Squirrel Origin. Jour. Amer. Med. Assn. Vol. LVII No. 16 Oct. 14, 1911. Occurrence of plague in rural districts and the relation of this to plague in the ground squirrels.

Mullowney, J. J. The Plague in North China. Jour. Amer. Med. Assn. Mar. 11 1911. The different types of the disease; how this outbreak originated; rats and fleas not so definitely related to pneumonic type as to bubonic.

Pringle, A. M. N. An Outbreak of Rat Plague in Suffolk. Public Health 24 1911 No. 4 pp. 126–131. Detailed account of this outbreak.

Raybaud, A. The Danger of Transporting Plague Long Distances Through the Intermediation of the Flea. Presse Med. (Paris) 1911 No. 19 pp. 179–180. Abs. Jour. Amer. Med. Assn. 56 (1911) No. 15 Apr. 15, p. 1152. Plague germs may remain virulent in the rat flea (*C. fasciatus*) during hibernation for a period of from 30 to 40 days. Infected fleas may take refuge in bales of goods or crates in boxes and practically hibernate while being shipped long distances.

Reid, S. How to Prevent the Plague. Ind. 70: 1063 4. May 18, 1911. The necessary measures to control the plague as a world wide problem.

Rothschild, N. C. Ceratophyllus sclantiewi Wagner, "a plague flea." Entom. Mo. Mag. June 1911 p. 141. A note in regard to this flea from Siberia and Manchuria. Fleas from "Tarabagans" which suffer from plague. Recent epidemic in Manchuria started among hunters of these animals. The fleas reported to feed on humans.

Rucker, W. C. Enzootic Plague in U. S. Military Surgeon Jan. 1911.

Russ, R. The Story of Plague. Bull. Cal. St. Bd. Health Feb. 1911. History good.

Shipley, A. E. Rat Fleas. Jour. Econ. Biol. Feb. 1911. Reprinted from ("Country Life"). Notes on common species, life history; list of genera.

Simpson, F. Ground Squirrel Eradication. Bull. (Cal. St. Bd. Health Feb., 1911. Different methods adopted in California. (1) Shooting or trapping. (2) Fumigation. (3) Poisoning.

Walter C. Upon the Inoculation of Materia Morbi Through the Human Skin Otherwise Than by Bites. Jour. Hyg. XI: 2. July 1911. Results of the experiments mostly negative. Points out the possible bearing of these results on the commonly accepted views as to the manner in which fleas transmit plague.

Wilder, R. M. Problem of Transmission of Typhus. Jour. Infec. Diseases, Chicago, July, 1911. Disease transmitted by insects, three should be suspected.—bedbug, louse,—latter stands incriminated and preventive measures should be directed against it.

Bubonic Plague in 1911. Cal. St. Bd. Health Bull. Sept. 1911 reports a case of

human infection said to have occurred while hunting ground squirrels in [illegible] Costa County.

Enzootic Plague in the United States. Editorial in Med. Record Feb. 11 [illegible] Reviews the recent outbreaks and shows the danger of other outbreaks unless [illegible] sistent steps are taken to destroy the hosts that harbor the disease.

Campaign against Plague-infected Squirrels in California. Public Health [illegible] Apr. 21, 1911. Data in regard to outbreaks in California since 1900. His[illegible] squirrel plague; methods of control; benefits derived as a result of control me[illegible] being adopted.

Rats. Ed. Ind. 70: 676-7 Mar. 30, 1911. Points out the dangers of allowing the rats to be present.

The Present Plague Situation. Ed. in Jour. Amer. Med. Assn. Feb. 11, 191[illegible] Review of recent outbreak in China and other countries, now in every continent; menace of the rat plague in England.

Mildness of the Manchurian Plague. Literary Digest Apr. 15, 1911 p. 72[illegible] Quotes Doctor Kitasato: This outbreak pulmonary plague: cannot spread through the air; digestive tract plague proof; direct contact necessary; this outbreak worst in history for this type of plague. The Marmot is supposed to be the source of the present outbreak. They are subject to epidemics of this plague, at such times are easily caught and as their fur is valuable the disease is thus easily distributed.

Anti-plague Measures. Ed. in Jour. Amer. Med. Assn. Apr. 29, 1911. Lit[illegible] danger of the outbreak in China extending to the United States. Measures to control ground squirrels on the Pacific Coast. Cost about $1,300,000 since July 1[illegible] nearly 100,000 rodents collected.

Rats and the Plague in England. Contemp. Rev. 99: 170-81, Feb. 1911. History of various outbreaks and the way in which plague is spread, and the means of controlling it.

Reports to Local Govt. Bd. on Pub. Health and Med. Sub. New ser. No. 52 Reports and papers on suspected cases of human plague in East Suffolk and on an epizootic of plague in rodents. 1. Report on suspected pneumonic and bubonic plague in East Suffolk and on the prevalence of plague in rodents in Suffolk and Essex by Dr. Bulstrode. (2) Observations on rat plague in East Suffolk by Dr. Martin and Rowland. (3) Reports on the pathological and bacteriological examination of rodents by Drs. Petrie and Macalester. (Rev. in Brit. Med. Jour. Vol. 26, 1911, p. 448.)

Investigations in Plague. Nature 85: 476-7, Feb. 9, 1911. Liv. Age. 268: 601-2 Mar. 11, 1911. Notes based on a review of the Reports of the Indian Plague [illegible]

Reports and Papers on Suspected Cases of Human Plague in East Suffolk [illegible] an Epizootic of Plague in Rodents. Repts. to Local Govt. Bd. on Pub. [illegible] and Med. Subjects New series No. 52 (1911).

Ticks and Various Diseases

Baetz, W. A case of American Relapsing Fever. N. Y. Med. Jour. Feb. 4 [illegible] A typical case in Canal Zone.

Balfour, A. Feeding Experiments in Fowl Spirochætosis. Lancet, July 22 [illegible] p. 223. Chickens were fed infected ticks and under some conditions develop disease. Likely that the granules penetrate the mucous membrane as gr[illegible] but possibly as young spirochætes.

Balfour, A. The Role of the Infective Granule in Certain Protozoal Di[illegible] Jour. Trop. Med. and Hyg. XIV: 17 Sept. 1, 1911. In discussing these refers [illegible] spirochætes in ticks.

Bishopp, F. C. Distribution of the Rocky Mountain Spotted Fever Tick. Bu. Ento. U. S. Dept. Agric. (Circu. 136) 1911. Occurs in Mont., Idaho, Wy., Utah, Nev., possibly also in Colo., Ore., and a corner of Cal. Calls it *D. occidentalis* Bish.

Bishopp, F. C. Some New North American Ixodidæ With Notes on Other Species. Proc. Biological Soc. Wash. XXIV (1911) pp. 197-208. Systematic.

Cooley, R. A. Tick Control in Relation to the Rocky Mountain Spotted Fever. Bul. 85 Mont. Agr. Ex. Sta. May 1911. Rev. of the work done, evidence against the ticks, methods of control. Believes that if domestic animals are kept free from ticks this will be sufficient protection.

Darling, S. T. Verurca Peruana. Jour. Amer. Med. Assn. LVII No. 26 Dec. 23 1911. Discusses this infectious disease which he says is probably transmitted by ticks or other suctorial invertebrates.

Dixon, R. W. East Coast Fever: Its Prevention and Eradication. Agric. Jour. of Union of South Africa. Vol. II (1911) No. 1 pp. 10-22. Character of the disease; the ticks that carry it and dipping as a remdey.

Giltner, H. A. Verruca Peruana or Carrion's Disease. Jour. Amer. Med. Assn. LVII No. 26, Dec. 23, 1911. Describes this disease which he believes will be found to be insect-borne.

Graybill, H. W. Studies on the Biology of the Texas Fever Tick. U. S. Dept. Agric. Bur. Anim. Indus. Bull. 130, pp. 7-42. 1911. Biology and methods of study. Bibliography.

Henshaw, H. W. and Birdseye, C. The Mammals of Bitterroot Valley, Montana, in Their Relation to Spotted Fever. Bur. of Biolog. Survey U. S. Dept. Agric. Circular No. 82, Aug. 1911. List of ticks on various mammals. Find that domestic animals are the host for the greatest number of engorged ticks and if they are made tick free by dipping, the chances of men becoming infected will be greatly lessened.

Hindle, E. The transmission of Spirochæta duttoni. Parasit. June 1911. Review of the relation of ticks to Relapsing fever; description of his experiments. Infection results from the entrance of infected material, excreted by the tick while feeding, into the open wound caused by the ticks' bite. Not the result of inoculation of infective material from the salivary glands.

Hindle, E. The Replasing Fever of Tropical Africa. A Review. Parasit. IV. Dec. 1911. A summary of our knowledge of this disease. Bibliography.

Hindle, E. On the Life-Cycle of Spirochæta gallinarum. Parasit. IV: 4 Dec. 1911. The life-history of this parasite in the fowl and ticks. Bibliography.

Howard, C. W. An Experiment in Fumigation of Ticks. Parasit. June, 1911. Experiments with a "Clayton Fumigating Apparatus" generating a sulphur gas found successful in ship holds, engorged females, however, were not killed.

Hunter, W. D. and Bishopp, F. C. Some of the More Important Ticks of the U. S. Year Book of U. S. Dept. of Agric. 1910 (pub. 1911). Economic and biologic notes on ten of the more common species.

Hunter, W. D. and Bishopp, F. C. The Rocky Mountain Spotted fever Tick With Special Reference to the Problem of Its Control in the Bitter-root Valley in Montana. U. S. Dept. Agric. Bu. Ento. Bull. 105, 1911. Distribution, life-history habits, other species; methods of control. Bibliography.

Lewis, H. E. Note on Eradication of Ticks by the Starvation Method. Agric. Jour. of Union of S. Africa Vol. I, no. 4, May, 1911. Results of experiments. An appendix gives tables showing the relationship between diseases of S. Africa and the ticks which transmit them.

Maver, M. B. Transmission of Spotted Fever by Ticks in Nature. Jour. Infec. Diseases Vol. 8: no. 3, Apr. 12, 1911. Ticks gathered from cows in Montana infected guinea pigs in the laboratory.

Maver, M. B. Transmission of Spotted Fever by other than Montana and Idaho Ticks. Jour. Infec. Diseases Vol. 8, No. 3, Apr. 12, 1911. Beside the Montana tick *D. venustus* and the Idaho tick, *D. modestus*, three other species, *D. nitens* Utah, and *D. variabilis*, Mass. and *Amblyomma americanum*, Mo. were found capable of transmitting the disease.

Merriman, G. The Geographical Distribution of *Ornithodoros moubata*. Parasit. June 1911. Gives maps and list of localities.

Moore, J. J. Time Relationships of the Wood-tick in the Transmission of Rocky Mountain Spotted Fever. Jour. Infec. Diseases Vol. 8, no. 3, Apr. 12, 1911. Minimum time for tick to infect guinea pig 1 hr. 45 minutes, average time about 10 hours, 20 hours almost constantly infective. Time necessary for a tick to become infective from feeding on a guinea pig about 25 hours. In nature this time may be much shorter. Minimum incubation period in tick not determined.

Neumann, L. G. Ixodidæ. Das Tierreich, Lieferung 26, 1911. Important monograph.

Nuttall, G. H. F. and **Merriman, G.** The process of Copulation in Ornithodoros moubata. Parasit. IV, 1, Mar. 1911, p. 39.

Nuttall, G. H. F. On the Adaptation of Ticks to the Habits of Their Hosts. Parasit. IV, 1, Mar. 1911, p. 46. Separates the ticks into groups according to their habits and shows how they are particularly adapted to their special mode of life.

Nuttall, G. H. F. On Symptoms Following Tick-bites in Man. Parasit. June 1911. Suggests the name "tick-bite fever" for a fever that frequently follows the bites of ticks.

Nuttall, G. H. F. Parasitology IV: Oct. 1911. Notes on Ticks I. (1) *Ixodes caledonicus*, description of male, together with considerations regarding the structure of the foot in Ixodes. (2) Types of parasitism in ticks, illustrated by a diagram together with some remarks upon longevity in ticks. (3) Regarding the host of life in ticks occurring on wandering hosts.

Sant'Anna, J. F. A Disease in Man Following Tick-bites and occurring in Lourenco Marques. Parasit. June 1911. A disease similar to Spirochætosis believed to be due to bite of ticks.

Theiler, A. Diseases, Ticks and Their Eradication. Agric. Jour. of the Union of S. Africa, Vol. I, No. 4, May 1911. Discusses the organisms which cause various diseases of domestic animals in Africa and the ticks which transmit them.

Theiler, A. Transmission of Amakebe by means of Rhipicephalus appendiculatus the Brown Tick. Proc. Roy. Soc. B. 84: 569 July 20, 1911. Jour. Trop. Med. and Hyg. XIV: 18 Sept. 15, 1911. This disease same as East Coast fever and shown to be transmitted by this tick.

Watkins-Pitchford, H. Dipping and Tick-destroying Agents. Agricul. Jour. of Union of S. Africa Vol. II, No. 1, July 1911. Summary of two previous reports which were published in Natal Agr. Jour., a full comprehensive account of experiments to prove that a system of dipping will check an invasion of East Coast fever or an outbreak of scab. Believes that the ticks can be eradicated.

Oriental Sore

Wenyon, C. M. Report of Six Months' Work of the Expedition to Bagdad on the Subject of Oriental Sore. Jour. Trop. Med. and Hyg. XIV: 7 Apr. 1, 1911. (From Rept. of Advisory Com. for Trop. Research Fund for 1910). Believes that the disease may be carried mechanically by houseflies, passing from these boi-

...sounds but that the parasite is more commonly transmitted by some sucking ... probably *Stegomyia* sp., possibly by sandflies.

Wenyon, C. M. Oriental Sore in Bagdad Together with Observations on a ... rine in *Stegomyia fasciata*, the Haemogregarine of dogs and the Flagellates of ...sflies. Parasit. IV: 3 Oct. 1911. A full discussion of the disease and the ...ible relation of flies, and mosquitoes and other insects to it.

Miscellaneous Articles

Burrill, A. C. The Tsetse Fly and Sleeping Sickness; other insect carriers of disease. Wisconsin Med. Jour. Jan. 1911.

Doane, R. W. An Annotated List of the Literature on Insects and Disease for the Year 1910. Jour. Econ. Ento. Aug. 1911. Discusses principal works and gives list arranged according to subjects.

Gentry, E. R. and Ferenbaugh, T. L. Endemic Malta (Mediterranean) fever in Texas and the isolation of the *Micrococcus melitensis* from two patients. Jour. Amer. Med. Assn. 57 (1911); No. 11 p. 889-891. Also No. 13, p. 1015-1018 and No. 14 p. 1127. Report cases of this fever in Texas.

Hutchinson, Woods. The Lesser Perils of Country Life. Munsey Magazine July 1911 p. 507. Insects as foes of mankind, mosquitoes, flies, etc., suggestions for campers. "Sure cures" etc. Poison oak.

Mays, Earl. The Conquest of Germs. The Outlook Jan. 28, 1911 p. 225. Bacteria and disease; malaria and yellow fever and other diseases discussed.

McCaw, W. Comparison of some Diseases Transmitted by Bloodsucking Insects. Old Dominion Jour. of Med. and Surg. Richmond, July '11.

Simpson, J. J. Entomological Research in British West Africa. I. Gambia. Bull. Ento. Research II pt. 3, pp. 187-239. Oct. 1911. Account of expedition giving notes on insect-borne diseases; character of the region; records of blood sucking Arthropods; bionomics of *Glossina*; remedial measures; directions for collecting various kinds of insects.

Snow, W. F. When Commerce and Health Unite. Bull. Cal. St. Bd. Health Feb. 1911. Law in regard to squirrels and methods of enforcing; necessity for such.

Swan, J. M. Tropical Diseases and Health in U. S. Ann. Amer. Acad. Pol. and Soc. Sci. Mar. 1911. pp. 391-411. Tells of the different diseases that may be or have been introduced.

Wellman, C. Insects and Medicine. Cal. St. Jour. of Med. Jan. 1911.

The Public Health Movement. The Annals of Amer. Acad. of Political and Social Sci. XXXVII: 2 Mar. 1911. This whole number is devoted to articles on this subject, some of which are noted under the proper headings.

Petroleum as a pabulum. Entomologists are ... ...leum or petroleum products for the destruction of insect life that we may ... difficulty in classifying this material as a food. Mr. D. L. Crawford (Pomona ... Journ. of Entomol. 4:687-97, 1912), adduces evidence to show not only ... the larvæ of *Psilopa petrolei* Coq. may survive immersion in crude petroleum, ... that they actually develop in this medium so unwholesome to most insect life. ... is made possible by certain mechanical and physiological specializations the ... preventing the oil penetrating the tracheal system, the latter enabling the ... ive apparatus to extract nutriment from such unpromising material. The ... must be regarded as one of the exceptions proving the rule.

E. P. Felt.

OBSERVATIONS ON THE IDENTITY OF THE WHEAT MIDGE

By E. P. Felt, *Albany, N. Y.*

The wheat midge, *Cecidomyia* or *Diplosis tritici* of authors, has been the subject of numerous economic accounts dealing with a very serious pest of wheat in America during the early half of the 19th century. One of the most detailed and exact of these comprises some 90 pages of the 6th report of Dr. Asa Fitch, then entomologist of the New York State Agricultural Society. This insect occupied such a prominent place in the earlier days that a desire to ascertain its identity at the present time should not lead to censure. The descriptions plainly indicate that the pest is a Diplosid. Unfortunately, other characters given, aside from biological data, are so general that they may be applied to many species and are therefore of little diagnostic value. The ultimate solution of the problem is not rendered easier by the destruction of Kirby's types, see Trans. Linn. Soc. 4:232. This insect has been referred by recent authors to the genus Contarinia and has been characterized as having an ovipositor twice the length of the body, a development which prevents our referring thereto any American form known to the writer as having been reared from wheat heads. The similarity of appearance among gall midges, even with those not closely allied, and the impossibility of construing too literally the descriptions of earlier writers complicate the situation greatly.

No question need arise in this connection as to the identity of the Hessian fly, *Phytophaga destructor* Say or *Cecidomyia cerealis* Roud., much better known in this country as *Cecidomyia* or *Mayetiola destructor* Say. No American species can be referred to *Contarinia tritici* Kirby, as stated above, and the same is true of the European *Diplosis equestris* Wagner, referable to either Clinodiplosis or Paralellodiplosis, the reddish larvæ of which produce an oval gall on wheat leaves. Two other European cereal midges should be mentioned, namely, *Lasioptera cerealis* Lind. which attacks the stem of rye, and *Epidosis cerealis* Sauter recorded as living in the larval stage on the leaves of barley.

Referring to species reared earlier, either in the New York State collections or loaned by the United States National Museum, we find an interesting condition. One species reared in this State is probably *Thecodiplosis mosellana* Gehin, while specimens presented by Dr. Fitch and labeled in his handwriting as the wheat midge are described below as *Prodiplosis fitchii*. A third species, characterized as *Itonida tritici*, was what we had supposed up till recently to

the true wheat midge, the *Cecidomyia* or *Contarinia tritici* Kirby. There are one or two other species which have been reared under conditions which led the collectors to consider them wheat midges. There is, in addition to the above, *Lestodiplosis caliptera* Fitch, an undoubtedly predaceous enemy of the wheat midge and possibly another form with similar habits. The evidence at hand is not sufficiently precise to permit a positive opinion as to which species is the destructive wheat midge referred to so frequently in earlier economic literature. It may be any one or all three of the species described in detail below or some other form. The evidence is summarized at this time and the species described in the hope that those working upon grain insects will give special attention to this problem whenever an opportunity presents itself for securing valuable data. It is extremely desirable to obtain rearings, preferably numerous adults, from infested fields in widely separated sections of the country.

Thecodiplosis mosellana Gehin

Midges tentatively referred to the above species by Prof. J. J. Kieffer of Bitch were reared from wheat chaff containing numerous stout, yellowish orange larvæ submitted for identification January 12, 1912, by Mr. E. P. Rumsey, Batavia, N. Y. The insects were responsible, according to Mr. Rumsey, for a shrinkage of 25 per cent in the yield of the field. Nearly every head seemed to be affected just before the grain was cut. The larvæ were so numerous in the sample sent, a fair representative of several bushels collected under the threshing machine, as to give a distinct yellowish appearance. There appears to have been no record or even suspicion that this European species might have become established in this country. Apparently the same larva was found in wheat heads at Belle Isle, N. Y., June 20, 1899.

Larva. Length 2.5 mm., yellowish orange, stout. Head small, rather long; antennæ stout, biarticulate; breastbone bidentate, the teeth diverging, obliquely truncate, the shaft long, slender and tapering posteriorly. Skin coarsely shagreened. Posterior extremity roundly truncate and with two submedian pairs of rather obtuse tubercles, the outer pair distinctly smaller.

Male. Length 1.5 mm. Antennæ a little longer than the body, thickly haired, dark brown, yellowish basally; 14 segments, the fifth with stems three and four one-half times their diameters. Palpi; the first segment short, stout, the second nearly length fully thrice its diameter, the third a little shorter than the second, the fourth one-half longer than the third. Face yellowish. Mesonotum dull reddish, the submedian lines yellowish, sparsely haired. Scutellum deep red, post-scutellum yellowish transparent. Abdomen with the basal half deep salmon, the distal segments yellowish transparent. Genitalia a variable yellowish and yellowish red. Wings hyaline. Halteres yellowish transparent, the knob reddish. Coxæ and femora pale yellowish, the remainder of the legs a variable light straw; claws long, slender,

evenly curved, the pulvilli shorter than the claws. Genitalia: basal clasp segment long, moderately stout; terminal clasp segment short, stout; dorsal plate deeply and triangularly emarginate, the lobes truncate or very broadly emarginate and sparsely setose; ventral plate long, broad, broadly and roundly emarginate, lobes short, narrowly rounded; style long, slender.

Female. Length 2.5 mm. Antennæ extending to the fifth abdominal segment, sparsely haired, fuscous yellowish, yellowish basally; 14 segments, the fifth with a stem three-fourths the length of the cylindric basal enlargement, which latter has a length thrice its diameter and slightly constricted near the basal third; terminal segment, basal enlargement with a length thrice its diameter, the appendage short, fingerlike. Palpi: first segment irregular, short, the second with a length nearly thrice its diameter, the third as long as the second and the fourth about one-half longer than the third. Face yellowish. Mesonotum reddish brown, the submedian lines fuscous yellowish, sparsely haired. Scutellum and postscutellum mostly dusky red. Abdomen pale yellowish orange. Halteres pale yellowish, the knob reddish. Coxæ yellowish; femora and tibiæ fuscous straw, the tarsi darker, the pulvilli nearly as long as the moderately stout claws. Ovipositor yellowish, stout, about one-half as long as the abdomen; terminal lobes lanceolate and sparsely setose. Cecida 2252.

Prodiplosis fitchii n. sp.

The specimens described below were found in association with larvæ and shrunken wheat kernels in the New York State collections, labeled "wheat midge" in the handwriting of Doctor Fitch and in all probability date back to the serious outbreaks of this insect studied by him, particularly as the color characters agree closely with his excellent account of this insect. We prefer to regard this species simply as one of the destructive forms, though it may possibly be only an associated midge. Though the specimens are in poor condition, the insect is tentatively referred to the above genus and characterized in the hope that its description will aid in establishing the identity of the midges injurious to American wheat.

Male. Length 1 mm. Antennæ fully one-half longer than the body, thinly haired, whitish; 14 segments, the fifth binodose and having the stems respectively two and one-half and three times their diameters. Distal node slightly produced with a length one-fourth greater than its diameter; circumfili apparently rudimentary or wanting. Distal segments possibly binodose, wanting. Palpi: first and second segments probably short, the third with a length about four times its diameter, the fourth a little longer than the third, narrowly oval. Face pale yellowish translucent, eyes large, coarsely granulate, black. Body a nearly uniform pale yellow, the scutellum, pleuræ and tip of abdomen pale yellowish orange. Wings hyaline, somewhat whitish. Halteres and legs mostly whitish. Genitalic structure indistinct, apparently similar to that of *P. floricola* Felt.

Female. Length 1.25 mm. Antennæ probably nearly as long as the body, sparsely haired, whitish; 14 segments, the fifth with a stem three-fourths the length of the cylindric basal enlargement, which latter has a length two and one-half times its diameter and sparse whorls of long, slender setæ subbasally and apically. Mesonotum yellowish. Abdomen pale yellowish white. The ovipositor stout, apparently with a length about half that of the abdomen; terminal lobes missing. Claws slender,

claws curved, simple, the pulvilli nearly as long as the claws. Other characters as in as given for the male. Type Cecid 1411.

Itonida tritici n. sp.

This species is a form provisionally referred[1] by the writer to *Cecidomyia tritici* Kirby. The specimens are in the United States National Museum collection at Washington, were labeled *Cecidomyia tritici* Kirby and were presumed to be the midge which caused so much loss to American wheat growers in earlier years, since they were reared by Mr. Theodore Pergande from typical wheat midge material. This can not be the European species, since the ovipositor is short.

Larva. Length 2 mm., moderately stout, reddish orange. Head small, tapering slightly. Antennæ stout, uniarticulate; breastbone distinct, bidentate, the teeth diverging, obliquely truncate; shaft slender, moderately chitinized. Skin coarsely shagreened, posterior extremity subtruncate and with six equidistant, subequal papillæ or tubercles.

Male. Length 1 mm. Antennæ one-half longer than the body, thickly haired; 14 segments, the fifth with stems respectively two and a half and three and a half times their diameters; terminal segment, distal enlargement cylindric, with a length two and a half times its diameter and a stout apical appendage three-fourths as long. Palpi; first segment quadrate, the second with a length three times its diameter, the third and fourth, the latter slightly dilated, each nearly as long as the second. Body yellowish. Wings hyaline, the third vein joining the margin well beyond the apex. Claws slender, strongly curved, the pulvilli shorter than the claws. Genitalia; basal clasp segment moderately stout; terminal clasp segment swollen basally, long; ventral plate short, very broadly and triangularly emarginate, the lobes diverging, narrowly rounded; ventral plate long, broad, deeply and roundly emarginate, the lobes slender, irregular apically; style long, swollen at the distal fourth.

Female. Antennæ nearly as long as the body, sparsely haired, deep brown or black; 14 segments, the fifth with a stem about as long as the cylindric basal enlargement, which latter has a length two and a half times its diameter and sparse basal circumapical whorls of stout setæ. Eyes black, face yellowish. Mesonotum ochre or orange yellow, darker anteriorly. Abdomen a bright orange or reddish orange. Ovipositor short, the lobes narrowly lanceolate, with a length about four times the width. Other characters nearly as in the male.

The structural details were drafted from specimens labeled *Cecidomyia tritici* and kindly placed at our disposal by Dr. Howard of the U. S. Bureau of Entomology. The color characters were taken from the description published by Dr. Fitch.

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1. New Haven, Conn., a warfare is being waged against mosquitoes, and about $8,500 has been raised by subscription to pay for oiling the breeding pools and for a certain amount of draining in the worst breeding places in the salt marshes. The local board of health has made regulations regarding receptacles such as rain barrels, tin cans, etc., in which mosquitoes may breed on private property.

1. 48 N. Y. St. Mus. Bul. 124, p. 414

THE CLOVER MITE

Bryobia pratensis Garman

By F. M. Webster, *Bureau of Entomology*

In preparing circular No. 158 treating upon this species the writer found such a voluminous record of its occurrence and habits throughout the country as to render the information unavailable for this particular publication.

Nevertheless, there is some ground for the criticism of an author who publishes on a species without giving all of the facts in his possession. The situation is usually brought to the front by other writers in after years publishing as new what was already known, but the facts locked up in the unpublished records of some individual or institution.

It has therefore been thought advisable to publish elsewhere the records of the Bureau of Entomology bearing upon this mite.

On December 5, 1878, eggs that afterwards hatched young of this mite were found on the branches of elm, especially about the forks, in the city of Washington, D. C., by Mr. Theo. Pergande, of the Bureau of Entomology. The young mites hatched January 18, 1879, and belong to this species, as afterwards described.

March 8, 1879, there were received from Mr. Charles French, Rye, N. Y., eggs which he found in large numbers on his peach trees and on grapevines in his neighborhood. Young mites of this species were reared from these eggs.

March 21, 1879, full-grown mites were found on elm, also in Washington, and eggs collected at the time developed mites three days later. Full-grown adults were also found on elm in the city on March 24.

On May 6, 1879, six years prior to publication of the description, Mr. Pergande discovered the mite injuring clover on the grounds of the Department of Agriculture and elsewhere about Washington, D. C. This injury was described at the time as giving the leaves of clover, especially the larger and older ones, a diseased appearance, as if attacked by a microscopic fungus. The younger leaves indicated very clearly that this appearance was caused by the feeding of this mite principally on the upper surface. As they slowly crawled along on the leaf they were observed to leave behind them not only a very fine silky web, but also a discolored narrow line winding irregularly about and imitating to perfection the mines produced by some of the microlepidopterous leaf-mining larvæ.

Work of *Sapyrda calcarata*, a pupa *in situ*.

December 12 of the same year some apple twigs and bark of apple trees were received from Prof. E. J. Wickson, of San Francisco, Cal., upon which were numbers of round red eggs similar to those that had been found in Washington. These eggs the following January developed mites of this species. On March 29, 1880, a piece of bark from an almond tree covered with red eggs, collected by Prof. H. B. Norton, State Normal School, Santa Clara County, Cal., was received through Professor Wickson, and on April 1 these eggs developed the young of this mite. On July 26, 1880, twigs and leaves of apple carrying the eggs and newly hatched young were received from Prof. J. H. Comstock, who had obtained them from Salt Lake City, Utah. A few developed individuals were also found upon these leaves and twigs. In October of this same year Professor Comstock brought them also from California.

January 12, 1881, branches of almond were received from Mr. G. W. Barnes, San Diego, Cal,. upon which were many eggs which afterward developed this mite.

March 2, 1882, twigs of plum were received from Mr. C. H. Dwinell, Berkeley, Cal., which were red with the eggs of this mite. Most of the eggs were empty, showing that many had already hatched.

October 13, 1883, a full-grown female was found by Mr. Pergande under bark of elm, in Washington, D. C., under conditions that seemed to indicate that she was depositing eggs under the bark. She was still ovipositing ten days later, and the eggs hatched April 19 of the following year.

January 28, 1884, a microscopic slide containing these mites, taken from bees, was received from Prof. A. J. Cook, Lansing, Mich. February 8 of the same year specimens were received through the Smithsonian Institution from Mr. W. H. Curtis, Haverhill, Mass. In this case the mites were said to have appeared by thousands in May and again in November, remaining each time for four or five weeks. They were first observed on the bricks outside a residence, but afterwards made their way into the house.

May 28, 1884, the mite was reported with specimens by Mr. George N. Kimball, Waltham, Mass., as found in large numbers in the sitting room of his house. December 9, 1885, eggs of this mite were received from Mr. Albert Koebele on twigs of cherry from Alameda, Cal.

January 12, 1888, a complaint was received from Mr. A. H. Mundt, Fairbury, Ill., that these mites were infesting houses. They were supposed to have come from willow trees growing in close proximity to the windows of the house.

May 26, 1888, the writer observed these mites literally swarming in some of the residences of Lafayette, Ind. Adults and young were observed infesting grasses on lawns in Lafayette on September 26.

December 13, 1888, specimens were received from Mrs. A. B. Wilmer, Franklin, Mich., with the complaint that they had made their way into houses in large numbers. Five days later Mr. Pergande found the mite in all stages of development, from egg to adult, some of the eggs just hatching, on the trunk of an arborvitæ in the grounds of the Department of Agriculture.

February 18, 1889, mites were received from Mr. C. L. Hall, Carpentaria, Cal. These were marked "Malva-weed mite." April 29 a section of twig of plum with eggs and one full-grown mite were received from Mr. J. H. Casterline, Santa Rosa, Cal.

June 6, some twigs of an unknown tree or shrub infested by these mites were received from Mr. E. Shipley, James Valley P. O., Oregon.

August 21, a piece of bark of cottonwood completely covered with the eggs of these mites was received from Mr. H. W. Turner, Valley Springs, Cal. The specimen was said to have come from Tuolumne County, Cal., at an elevation of 8,000 feet.

On December 12, 1889, the writer, then stationed at Lafayette, Ind., observed these mites swarming into a residence through crevices about doors and windows. When they first appeared, about the 5th inst., they seemed to be full grown, but later there were many young also making their way into the houses. They showed no disposition to infest roses or geraniums growing in pots in windows, but would swarm upon the glass of these same windows.

January 28, 1890, specimens of the mite were received from Mr. L. H. Ellis, Wilmington, Ohio. On May 26, 1890, an empty egg-mass belonging to a species of spider, taken from the stone foundation of a house, contained numerous young of these mites. They were received from Mr. B. H. Roberts, North Chili, N. Y.

February 19, 1892, specimens of this mite were received from Mrs. I. Smith, Williamsport, Ind., with the complaint that houses were badly infested by them. April 15, eggs of this mite were received on a branch of cherry from Mr. J. C. Sharps, Portland, Ore. May 17 the same mite was received from M. E. Russell, Hartford, Conn.

July 28, 1893, section of branches of pear covered with eggs of this mite were received from Canon City, Col., by Mr. G. M. Dubois, who stated that the mite was rapidly increasing in numbers, threatening to destroy large pear and apple trees. December of the same year specimens were received from Mr. D. W. Coquillett, Los Angeles, Cal., who found them in houses April 28, and eggs found upon pear trees hatched these mites on May 10.

June 12, 1894, a piece of apple twig covered with eggs of this mite was received from Prof. T. D. A. Cockerell, Las Cruces, N. M. October 16, 1894, alcoholic specimens were received from Prof. F. L.

Washburn, Corvallis, Ore., together with the statement that mites and eggs were found under burlap bands that had been placed upon the trunks of apple trees.

June 13, 1894, a lot of these mites was received from Mr. Geo. W. King, Lawrence, Mass. Mr. King stated that they came into the courthouse and were found on the window-sills every year. September 8, 1894, alcoholic specimens were received from Fort Collins, Col., from Prof. C. P. Gillette, who reported them very abundant on the limbs and trunks of pear, apple, plum and cherry at Fruita, Grand Junction, Delta, Canon City, and Denver, Col. December 10, 1894, a piece of apple twig covered with eggs of this mite was received from Mr. N. A. Jacobson, Payette, Idaho.

In May, 1895, a correspondent from Garfield, Ohio, complained that these mites were swarming in his house and covering the walls near the door. Two pine trees growing near the house were swarming with them. This was the third year that they had occurred in this way. September 13 of the same year twigs of pear covered with the eggs of this species were received from Mr. A. Engberg, Salem, Utah, with the statement that they seriously retarded the growth of fruit trees.

March 12, 1896, a small branch of apple carrying eggs of this species was received from Mr. T. A. Hitt, Weiser, Idaho. March 20, a section of bark of pear with eggs of this mite was received from Mr. Robert Milliken, Nampa, Idaho. October 22, 1896, twigs of peach with egg-shells and cast-skins of this mite thereon were received from Prof. G. McCarthy, Raleigh, N. C.

November 21, 1896, specimens of the mite were received from Rachel Berry, McCook, Neb., with a statement that they had been annoying her for a long time by collecting upon the window-sills, especially on the sunny side of her house. December 11 of the same year both mites and eggs were received from Mr. H. Russell Hill, Williamsport, Pa., with the statement that they had appeared in "hundreds of thousands" upon the walls of the city hall of that place, creeping through the cracks of the windows into the offices to deposit their eggs. Eggs were hatching when received.

February 17, 1897, eggs of the mite were received on a cherry twig from Mr. B. L. Berman, Salem, Mass. On April 2, twigs of pear with eggs of this mite were received from Rep. John C. Bell, of Colorado. June 1, 1897, specimens were received from Mr. Paul Forster, Utah Agricultural Experiment Station, Logan, Utah, with a statement that the mites were very destructive to apple, pear, and cherry trees in Utah. July 13, leaves of apple grown on the foothills of Yucaipa, Cal., were received from Mr. S. A. Pease, with the state-

ment that the leaves and twigs had much the appearance of having been affected with mildew. August 4, leaves of plum injured by this mite were received from Mr. W. N. Cole, Salt Lake City, Utah. Mr. Cole stated that they also injured the leaves of apple. On the 31st a section of bark of pear covered with eggs of this mite was also received from Mr. Cole. September 11, a section of bark of apple or pear covered with the eggs of the mite was received from Mr. J. P. Sorensen, Salt Lake City, Utah. December 13, Mr. W. H. Owen, of Catawba Island, Ohio, sent twigs of peach infested with the eggs of this species. The writer also observed the eggs in great abundance upon the twigs of both peach and plum on Catawba Island at about this time or a little later.

March 5, 1898, apple twigs bearing the eggs of this species were received from W. McOrr, Fruitland, Ontario, Canada. April 13, 1898, twigs of *Prunus simonii*, with eggs of this mite attached, were received from Mr. U. G. Keeney, Queens Grove, Ind. May 20, 1898, a mite was received from Mr. Marcus J. Smith, Squaretop, Pa., together with the statement that it attacked radishes, lettuce, onions and small buckwheat, but appeared to be worse on small onions. November 16, 1898, the eggs of this mite were received on chestnut from Parry Bros., nurserymen, Parry, N. J. December 22, 1898, Dr. James Fletcher, Dominion Entomologist, Ottawa, Canada, transmitted specimens received from a Mr. Shepherd, Richmond, Kan., who stated that they appeared in myriads in November of that year and stayed throughout the winter until the following June.

January 13, 1899, eggs of this species were sent by Mr. H. C. Peck, Brighton, N. Y., on twigs of plum. Three days later the egg-shells of this mite were received from California through Mr. M. D. Pierce, of the California Department of Vegetable Pathology. May 19, dead specimens of the mite were sent by Mr. W. Holden, Aurora, Ill., with the report that there were millions of them, and that they crawled into the house, covering the window casings and glass. June 28 of the same year specimens were received from Mr. J. E. Burch, Mesa, Ariz., on leaves of peach. September 8, twigs of pear with numerous eggs of this species were received from Mr. H. P. Olin, Deming, N. M., with the complaint that the mites were destroying the fruit trees in that vicinity. They were at the time working on the Bartlett pear, apple, and yellow egg-plum. The pest had not previously been observed in that locality. October 5, pieces of bark of almond infested by eggs of this species were received from Mr. F. Austin, Escondido, Cal. December 27, a twig containing eggs of this insect was received from Mr. G. G. Atwood, Geneva, N. Y. January 23, 1900, mites which were evidently infesting a

[illegible]ember were received from Mr. G. H. Buffum, Denver, Colo. August 11, 1900, eggshells of this mite were received from Mr. C. B. [illegible]nson, Weiser, Idaho, on a twig of pear. Under date of May 18, 1901, Prof. Fabian Garcia, Mesilla Park, N. M., sent twigs of apple, the leaves of which were blighted by this mite. June 7, 1901, specimens were received from Mr. Thomas J. Morrell, Ogunquit, Me., with the complaint that they were very destructive to plants and vines in that neighborhood. Under date of October 25, 1907, Mr. M. J. Ellis, of Wausau, Wis., forwarded a complaint to the Bureau that this mite attacked people while in bed—the only instance on record of this character. The house appeared to have been swarming with the mite. This occurrence was in April, 1906.

Mr. C. N. Ainslie, of the Bureau of Entomology, found swarms of these mites in Washington on the grounds of the United States Department of Agriculture and about the Washington Monument April 22, 1908. Mr. James A. Hyslop, also of this Bureau, found the mites excessively abundant on volunteer oats at Grant Road near Washington, D. C., April 17, 1909. The infested leaves were thickly dotted with white spots, which he attributed to the work of this mite. Mr. T. H. Parks, of this Bureau, found the mites excessively abundant in the alfalfa fields about Wellington, Kan., during April, 1910. He counted as many as fifteen mites on the top of one alfalfa leaf. Mr. E. O. G. Kelly, also of this Bureau, April 17, 1911, found that these mites caused slight injury to the leaves of alfalfa. The writer has known them to take possession of a newly erected farmhouse in Ohio during autumn.

These mites were also observed attacking blue grass at Nashville, Tenn., December 28, 1911, by Mr. G. G. Ainslie of the Bureau of Entomology.

Eriococcus borealis in Colorado. In JOURN. ECON. ENT., Oct., 1910, p. 428, I recorded an undetermined *Eriococcus*, represented only by males, from Folland, Colorado. Mr. E. Bethel has now sent me good females, which he collected at Folland, October 7, 1911, on *Betula glandulosa*. The species proves to be *Eriococcus borealis* Ckll., as was expected. The following measurements, in microns, are from Folland specimens; Antennæ 7-jointed, joints (1.) 18, (2.) 40–45, (3) 53–57, (4) 53–60, (5) 20–28, (6) 18–23, (7) 33–40; hair at end of last joint 45; larger dermal pores 48; setæ of caudal lobes 125; labium 130 long and about 100 wide at base; leg with femur + trochanter 200 long, tibia 125, tarsus 130, width of femur 75. Aug. 23, 1911, I collected *Erium lichtensioides* Ckll., on *Artemisia tridentata* at Folland at an altitude of about 9000 ft.; very high both for the coccid and plant.—T. D. A. COCKERELL, *Boulder, Colorado.*

GIPSY MOTH FROM JAPAN—A WARNING

By C. Gordon Hewitt, *Dominion Entomologist*

In a shipment of nursery stock, consisting of Thuya, Cherries, Maples, Clematis, etc., imported into Canada from Japan by the Yokohama Nursery Company and inspected at Vancouver, where all Japanese stock is being inspected and fumigated in accordance with the requirements of The Destructive Insect and Pest Act (see Journ. Econ. Ent. Vol. IV., pp. 358 362), Mr. R. C. Treherne, our officer in charge, recently found eight egg clusters of the Japanese Gipsy Moth. One of these clusters was broken and the larvæ had hatched. Six of the remaining egg clusters were sent to the Division of Entomology, Ottawa, and on arrival it was found that several hundred of the larvæ had hatched *en route*. The infested shipment was, of course, burnt. Apart from the presence of Gipsy Moth, we find in our inspection work that nursery stock from Japan is exceptionally infested with Bagworms, Tortrix larvæ, Coccidæ, etc. It is important, therefore, that all those who have charge of the inspection of imports of nursery stock should pay special attention to shipments from Japan.

Ottawa, 24th April, 1912.

ENTOMOLOGISTS' EMPLOYMENT BUREAU

As stated in the last number of the Journal, pursuant to an action of the Association at the Minneapolis meeting, the above named Bureau was established. A word of explanation regarding this project may not be out of place at this time. The writer has consented to assume the direction of this work with some hesitation for one year only as an experiment, because there seemed to be no one ready at the date to shoulder the responsibility. As previously stated, the idea embodied in the project is to get institutions which need entomologists, in touch with entomologists seeking positions, without the latter being obliged, in the case of election, to pay large fees or percentages of the first year's salary to an agency. With that thought a fee of $4 has been established, to be deposited with the Bureau at the time of filing application, statement and qualifications, experience, references, and character of work desired. This money is to cover the expenses of book-keeping, filing, clerk hire, stationary, etc., and is not returnable in case of lack of success. No regular dues of any kind are required, and the figure above quoted might be changed at any meeting of the Association if experience should show that it was desirable to do so.

The application of any candidate will be treated with the utmost confidence. A candidate, however, must bear in mind that the very fact of the Bureau's placing his name and qualifications before a would-be employer releases the fact of his seeking employment from the confidential records of the Bureau, and the possible employer who receives the information he seeks from the Bureau is not bound to observe the confidence of the applicant assumed and respected by the Bureau itself. Any suggestions upon this point, or along any lines connected with the work will be gladly received by the writer.

F. L. Washburn.

Scientific Notes

Queen Bees and Other Insects in the Mails Postmaster General Hitchcock has amended Paragraph 7, Section 496, Postal Laws and Regulations, by substituting for the first clause thereof the following:

Queen bees and their attendant bees, when accompanied by a copy of a certificate of the current year from a State or Government apiary inspector to the effect that the apiary from which said queen bees are shipped is free from disease or by a copy of a statement by the bee-keeper made before a notary public or other officer having a seal that the honey used in making the candy used in the queen mailing cage has been diluted and boiled in a closed vessel.

The whole paragraph as amended reads as follows:

7 Queen bees and their attendant bees, when accompanied by a copy of a certificate of the current year from a State or Government apiary inspector to the effect that the apiary from which said queen bees are shipped is free from disease or by a copy of a statement by the bee-keeper made before a notary public or other officer having a seal that the honey used in making the candy used in the queen mailing cage has been diluted and boiled in a closed vessel; beneficial insects, when shipped by departments of entomology in agricultural colleges and persons holding official entomological positions; other live insects, when addressed to the Bureau of Entomology of the United States Department of Agriculture, to departments of entomology in State agricultural colleges, and to persons holding official entomological positions, and dried insects and dried reptiles, may be sent in the mails when so put up as to render it practically impossible that the package shall be broken in transit, or the persons handling the same be injured, or the mail bags or their contents soiled.

Anthrenus verbasci Linn. is, as is well known, a common museum pest capable of subsisting on a considerable variety of dry animal and vegetable substances. Three years ago* we recorded the continuous breeding of this insect during a period of seven years, dating from April 4, 1902, in a two quart Mason jar kept tightly closed and with no moisture aside from that in the somewhat dry corn it contained. The conditions are practically the same as those recorded three years ago, aside from the fact that there is more brown, honeycombed, sponge-like debris in the bottom of the jar. There yet remains much uneaten corn and the insects, if anything, are more abundant than three years ago. This record now covers a period of ten years and, judging from conditions at present obtaining, may easily continue for another decade or possibly longer. It is of interest, since it throws some light upon the possibilities of insects living for long periods under unfavorable conditions.

E. P. Felt.

*1909 Econ. Ent. Journ. 2:193.

JOURNAL OF ECONOMIC ENTOMOLOGY

OFFICIAL ORGAN AMERICAN ASSOCIATION OF ECONOMIC ENTOMOLOGISTS

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The editors will thankfully receive news items and other matter likely to be of interest to subscribers. Papers will be published, so far as possible, in the order of reception. All extended contributions, at least, should be in the hands of the editor the first of the month preceding publication. Reprints may be obtained at cost. Contributors are requested to supply electrotypes for the larger illustrations so far as possible. The receipt of all papers will be acknowledged.—EDS.

Attention is called to the announcement of the Entomologists' Employment Bureau on another page. This disinterested effort on the part of a few should be loyally supported by both employers and employees. Any such means for bringing the two together can not but react beneficially.

A second installation of the classified bibliography on insects and disease appears in this issue. The subject is of vital importance to the general welfare of the country, and such a compilation will greatly assist entomologists keeping in touch with progress along this line. Reference to the bibliography shows that there are still a number of problems worthy of study in cooperation with the medical fraternity, since without the assistance of the latter, material progress is impossible aside from general studies upon the biology and methods of controlling pathogenic forms.

A study of methods of illustration is not an unpromising subject. One need only to look over entomological bulletins and reports, or better still, recently published general works to see the great diversity obtaining. Photographs of various degrees of excellence and an even greater range of magnification appear here and there. The same is true of line and wash drawings, and, to a certain extent, of colored illustrations. These differences are greatly emphasized when inharmonious illustrations are assembled in some general work under conditions precluding the preparation of a large series of original figures. With many laboring under very diverse conditions, we must expect great differences. Is it not possible, through a recognition of certain fundamentals, to eliminate some of the more glaring inconsistencies? The degree of magnification has an important effect on appearances. No illustration should be larger than necessary to bring out important characters—mere size is not valuable in a figure, be it line, wash or colored. Nothing should be published unless the valuable feature is clearly shown. An illustration unintelligible

without a legend to any one excepting possibly the artist and the author is of little service, yet such occasionally appears. The selection of method must depend in large measure on the subject, the ability of the artist, the paper to be used and local resources. A good line or wash drawing is better than a poor colored plate. American illustrations of recent years average much better than those of earlier days, though there is still room for improvement.

Reviews

J. R. INDA. **La conchuela del frijol** (*Epilachna corrupta* Muls.), Circ. 33, Estacion Agricola Central, 1910.

This circular deals with the most important insect enemy of beans in Mexico. On account of the extensive use of beans among the Mexicans the damage by this insect is of great importance. The species is said to occur in ten of the northern states of Mexico and undoubtedly is to be found in other districts in the republic. In addition to geographical distribution the circular discusses injury and methods of control. Principal stress is placed upon hand picking of the eggs and larvae and the use of copper sulphate or kerosene emulsion.

G. GÁNDARA. **Informe de la comision desempeñada por el Senor G. Gándara en Jamiltepec, Oaxaca, para combatir una plaga de gusanos en el algodon.** Bull. 43, Estacion Agricola Central, 1910.

This bulletin deals with a special trip undertaken by Professor Gándara to investigate damage by the cotton worm (*Alabama argillacea* Hbn.) in a locality in the state of Oaxaca about 200 miles south of Mexico City. The publication is of special interest because it gives the first information regarding the seasonal history of the cotton worm in any region south of the United States. In the portion of the state of Oaxaca where the observations were made the cotton is usually planted at the beginning of September. Generally damage by the worm is not noticed until October or November. In 1909, however, the insects appeared in September, although it was not until the 15th of November that the outbreak assumed serious proportions. With the use of Paris Green Professor Gándara checked the damage almost immediately.

A. MADARIAGA. **Estudio de una plaga de parasitos en las gallinas, de la estacion agricola central.** Circ. 26, Estacion Agricola Central, 1910.

This circular deals with an outbreak of fowl parasites at the Central Experiment Station near Mexico City. The principal species concerned was *Dermanyssus gallinæ*. Two Mallophagids, *Goniodes hologaster* and *Menopon biseriatum* were found in much smaller numbers. A number of experiments were performed with kerosene emulsion, turpentine, pyrethrum and other substances without very satisfactory results. It was found, however, that a kerosene emulsion with turpentine added was much more effective than anything tried. This mixture is recommended for use against the mites. For the Mallophagids the fumigation of the fowls with sulphur in special boxes through the tops of which the heads are allowed to protrude is advised.

G. GÁNDARA. **La plaga de las garrapatas y medios para combatirla.** Circl. 22, Estacion Agricola Central, 1910.

This circular deals with the cattle tick which occurs throughout Mexico and causes enormous losses. Dipping vats are described in detail and an outline is given of a method of pasture rotation which is practicable under Mexican conditions.

L. DE LA BARREDA. **Doryphora de la patata.** Bull. Estacion Agricola Experimental de Rioverde, San Louis Potosi, 1910.

This bulletin deals with observations and experiments on *Leptinotarsa decemlineata* made on plots of potatoes growing on the grounds of the experiment station at Rioverde. The writer sets forth in a skillful manner considerable elementary information regarding the life history of the insect, with the intent of interesting the readers in observations on injurious insects of various kinds. After a discussion of historical and biological matters, the bulletin proceeds to an account of experiments made with Paris green which destroyed the beetles although the plants succumbed later to the attacks of fungus enemies.

R. RAMIREZ. **Mosquitas de la fruta.** Circl. Estacion Agricola Central, 1909.

This leaflet deals with several species of Drosophila which appear to follow rather than to cause injury to fruits of various kinds. The colored plate which accompanies this circular is evidently incorrect in showing some Coleopterous larva as the larva of Drosophila.

GUILLERMO GÁNDARA. **Enfermedades y Plagas del Naranjo.** Boletin No. 31, Estacion Agricola Central, 1910.

Professor Gándara presents a comprehensive treatment of the diseases and insect enemies of the orange in Mexico. The bulletin covers 51 pages and is accompanied by 60 illustrations, many of which are colored plates. Among the insects 32 species are discussed of which 16 are coccids. The list includes in addition one Aleurodid, one Aphid, three Hemipterons, one Dipteron, one Lepidopteron, two ants, five Coleopterons and one Acarid.

Of most interest to American entomologists is the discussion of *Trypeda ludens*. The pest is said to be restricted to the state of Yautepec and other localities in the "tierra caliente." Reference is made to the former absolute quarantine against Mexican oranges in the state of California and the statement is made that the interdiction was found to be entirely unnecessary because of the biological impossibility that the insect would be able to develop in that state.

JULIO RIQUELME INDA. **El Gusano de los Sauces.** (*Clisiocampa azteca* Neum). Boletin No. 63, Estacion Agricola Central, 1911.

This bulletin deals with a local pest (*Clisiocampa azteca* Neum) of the weeping willow. In the vicinity of Mexico City this insect frequently defoliates the willows during the months of March and April. In addition to the injury to these important shade trees, the species is a pest on account of the numerous urticating hairs with which it bears. The bulletin discusses geographical distribution, amount of injury and methods of control. It is accompanied by four plates.

E. LOPEZ VALLEJO. **Estro del Carnero.** Boletin No. 21. Estacion Agricola Central, 1909.

This bulletin deals with *Oestrus ovis* which is said to be very abundant throughout the republic of Mexico. In Mexico City it appears that the majority of the sheep and goats which are slaughtered are infested with this parasite. Considerable information regarding life history and development is given and preventive and direct measures of control are discussed.

FRANCISCO LOPEZ VALLEJO. **Algunas Enfermedades del Ganado Ovino.** Boletin No. 49, Estacion Agricola Central, 1910.

The author discusses the diseases of sheep in general but a large portion of the bulletin is devoted to the insect and Acarid parasites of these animals. The species included are *Sarcoptes scabei; Psoroptes communis, Trichodectes* sp. and *Melophagus ovinus.* Appropriate methods of treatment are given in the discussion of each species.

W. D. HUNTER.

Butterfly-Hunting in Many Lands, Notes of a Field Naturalist, by GEORGE B. LONGSTAFF. Longmans, Green, & Co., 1912. pp. XVIII + 721., 16 plates (7 colored)

The author has given us in this bulky volume, a narrative account of his experiences in collecting insects in widely separated countries, such as Asia, South Africa, Canada, India, Australia and New Zealand. The work is enlivened by incidental and more or less irrelevant notes relating to achievements or experiences, such as climbing a volcano and the results of an earthquake. Nearly 500 pages are devoted to this form of record, the butterflies hardly receiving more attention than the moths, and there being in addition, observations on numerous other insects belonging to various orders. The time spent in each country was necessarily limited and the lists of species are of little value so far as indicating geographical distribution.

The more important observations on habits, etc., are discussed in a chapter on Lepidoptera, which gives considerable data on scents, color, juices, tenacity of life, mutilation, experiments on palatability, mimicry, etc. An appendix gives translations of twelve papers by Fritz Muller, dealing with the scent organs of butterflies and largely inaccessible to naturalists, since they were published in the Archivos do Museu Nacional do Rio de Janeiro or other nearly as inaccessible journals. The plates are excellent and the value of the work materially enhanced by a comprehensive index. This volume will appeal mostly to general collectors and students of Lepidoptera.

The More Important Insects and Fungous Enemies of the Fruit and Foliage of the Apple, by A. L. QUAINTANCE and W. M. SCOTT. U. S. Department of Agriculture, Farmers Bulletin 492, p. 1-48, 1912.

This popular bulletin gives summary accounts of a number of the more important insects, such as the codling moth, plum curculio, canker worms, and of such diseases as apple scab, bitter rot, apple blotch and cedar rust. There are a few brief remarks on the possibility of controlling San Jose scale by the use of dilute lime-sulfur washes, otherwise this insect is ignored, and the reason is probably due to this pest being

considered mostly as an enemy of the branches rather than of fruit and foliage. We fear many fruit growers will be slightly misled by the title.

The country is a large one and it is extremely difficult to make general recommendations which apply equally well to all sections. This is apparent in the somewhat elaborate schedule of spray applications at the outset, admittedly very elastic, which nevertheless, recommends some six sprayings in all and gives little indication that in some sections of the country fewer treatments would be nearly, if not quite as effective. Among other things, we find one spray advised "eight to nine weeks after the petals fall (about June 25–30)." The dates are probably those of latitude 38° or 39° and four weeks early for latitude 43°, comprising some important fruit growing sections. Dates, if given, should certainly be inclusive for typical regions. Might it not be well to admit that in some important fruit sections serious injury by apple scab and early leaf feeders, such as the plum curculio, canker worms, leaf moth, case-bearers and tent caterpillars is extremely unlikely if the trees are sprayed annually for the codling moth? We fear that in some instances entomologists have recommended more spraying than fruit growers find of value when subjected to the practical test of experience.

Current Notes

Conducted by the Associate Editor

Mr. John A. Grossbeck has given to the American Museum of Natural History his entire collection of Geometridæ, in addition to the series previously donated.

Mr. T. H. Jones, of the Bureau of Entomology, has been appointed assistant entomologist of the Porto Rico Sugar Planters' Experiment Station at Rio Piedras.

W. P. Fraser has been appointed lecturer, and P. I. Bryce assistant, in biology at MacDonald College, St. Anne de Bellevue, Montreal, P. Q.

According to the *Experiment Station Record*, the new entomology building of the New Jersey Station and College has been completed and the equipment of the department installed therein.

Dr. William C. Gorgas, chief sanitary officer of the Panama Canal Zone, will be the speaker at the annual Commencement exercises at Johns Hopkins University, June 11th.

An honorary degree in medicine was conferred upon Sir Ronald Ross on the occasion of the celebration of the seventy-fifth anniversary of the founding of the University of Athens, April 10th.

Professors William M. Wheeler and Roland Thaxter, both professors at Harvard University and members of this association, were elected members of the National Academy of Sciences, at a meeting held in Washington April 18th.

Professor Philip P. Calvert, Dr. Henry Skinner and Dr. W. J. Holland have been appointed delegates from the Academy of Natural Sciences of Philadelphia to the Second International Congress of Entomology, Oxford, England, August 5–10.

Professor Thomas H. Montgomery, Jr., professor of Zoology in the University of Pennsylvania, a prominent investigator, and the author of a number of papers on spiders and insects, died on March 19th of penumonia, at the age of thirty-nine years.

[illegible]-state mosquito extermination work at the New Jersey Agricultural Experiment [illegible] has been placed in charge of Mr. Herman H. Brehme, who has been appointed [illegible] executive officer. Mr. Brehme was for several years assistant to the late Professor John B. Smith, and was engaged in this kind of work.

According to *Science*, Mr. C. W. Leng has placed "his valuable collection of long-horned beetles (Cerambycidae) at the disposal of the American Museum of Natural History for use in filling gaps in its collections. This means a gift of some 870 specimens covering nearly 300 species not hitherto acquired."

Professor W. M. Scott, formerly State Entomologist of Georgia, and recently pathologist of the Bureau of Plant Industry of the U. S. Department of Agriculture, a member of this Association, will now take charge of a newly established department of the Thomsen Chemical Company, Baltimore, Md. Professor Scott will be engaged in research and special service in connection with the insects and fungous diseases of fruits and truck crops.

Mr. William Beutenmuller, for many years Curator of Entomology, at the American Museum of Natural History, New York City, is no longer connected with the Museum. Mr. Beutenmuller is soon to start on an extensive collecting trip in the mountains of North Carolina. Any one desiring material from that locality should communicate with him at his residence, 879 Whitlock Avenue, Bronx, New York City.

The following have been appointed delegates to represent the Entomological Society of America at the Second International Congress of Entomology to be held at Oxford, England, August 5–10, 1912: Prof. J. H. Comstock, Cornell University, Ithaca, N. Y.; Dr. Henry Skinner, Academy of Natural Sciences, Philadelphia; Dr. P. P. Calvert, University of Pennsylvania, Philadelphia, Pa.; Prof. Herbert Osborn, Ohio State University, Columbus, Ohio; Prof. V. L. Kellogg, Leland Stanford Jr. University, Palo Alto, Cal.; Dr. W. J. Holland, Carnegie Museum, Pittsburg, Pa.

Professor F. M. Webster, in charge of cereal and forage insect investigations of the Bureau of Entomology, Washington, D. C., represented the Entomological Society of Ontario, of which he is a corresponding member, at the celebration of the Centenary of the Foundation of the Academy of Natural Sciences, Philadelphia.

The following ordinance for the purpose of controlling the house fly nuisance has been enacted by the Board of Aldermen of New Haven, Conn: "Section 343 of the Ordinances of the City of New Haven is hereby amended by adding at the end thereof the following: No person shall place, leave, or suffer to remain upon any premises in said city any stable manure (except for fertilizing purposes) or refuse matter in which flies may breed, unless the same is enclosed in a tight box, pit or other receptacle which shall be kept closely covered so as to exclude all flies at all times except when said manure or refuse matter is being placed therein or removed therefrom. During the months of May, June, July, August, September, October and November it shall be unlawful for any person to allow said stable manure or refuse matter to remain unremoved for a period of over seven days. The foregoing is a true and correct copy of record and said ordinance will become operative and in effect April 26, 1912."

According to *Science*, the names of Dr. A. Agramonte and Dr. C. J. Finlay have been presented to the Nobel Prize Commission by the Academy of Science, the medical faculty of the University of Havana, and several other scientific societies and institutions, as candidates for the prize to be awarded in 1912. A resolution recommending their names states that Doctor Finlay was the first to claim that

yellow fever is transmitted by the bites of mosquitoes, and Doctor Agramonte is the only remaining member of the United States Army Board, consisting of Drs. Reed, Lazear, Carroll, and Agramonte, which investigated and finally demonstrated the correctness of this theory.

At Cornell University, G. W. Herrick and W. A. Riley were recently promoted to the rank of full professors, and Robert Matheson and George C. Embody were promoted from instructors to assistant professors in the department of entomology.

Mr. E. L. Jenne, Entomological Assistant engaged in Deciduous Fruit-Insect Investigations, Bureau of Entomology, U. S. Department of Agriculture, died at Walnut Creek, Cal., May 10th, 1912, at the age of twenty-seven years. Mr. Jenne was known by his work on the codling moth, and his more recent studies on the plum Curculio will soon be published. He graduated from Washington State College and from Cornell University.

The total appropriations for the Bureau of Entomology, as recommended by the Senate Committee on Agriculture and Forestry, for the Fiscal year beginning July 1, 1912, amounts to $691,840, allotted as follows:

Salaries	$58,750.00
Deciduous Fruit Insects	40,600.00
Cereal and Forage Insects (including the alfalfa weevil)	85,000.00
Southern Field Crop Insects	47,160.00
Forest Insects	44,750.00
Truck Crop and Stored Product insects (including sugar beet insects)	39,500.00
Bee Culture	15,000.00
Citrus Fruit Insects (including the white fly)	21,500.00
Investigation of the Mediterranean Fly (immediately available)	35,000.00
Miscellaneous Insects	19,740.00
Preventing Spread of Moths	284,840.00
Total	$691,840.00

The Committee has recommended an increase of $15,000 for the investigation of insects affecting truck crops and stored products, including sugar beets, under the direction of Dr. F. H. Chittenden, and an increase of $35,000 (of which sum $10,000 is to be immediately available) for the investigation of insects affecting cereal and forage plants, including the alfalfa weevil. This work comes under the supervision of Prof. F. M. Webster, in charge of Cereal and Forage Insect investigations.

William H. Patterson, Agricultural School, Imperial Department of Agriculture, St. Vincent, W. I., we are advised, has accepted the post of Government Entomologist to the Gold Coast Colony, West Africa. He will spend three months in England prior to commencing work in the new field.

Science mentions an article printed in *London Times* regarding the experiments of the Liverpool School of Tropical Medicine, containing the report of the Luangwa Sleeping Sickness Commission. Human trypanosomes were found in the blood of game animals, and these are transmitted by a fly, *Glossina morsitans* West., approximately five per cent of the flies becoming permanently infected and capable of transmitting the infection. An infected fly retains the power of transmitting the infection during its life. Certain species of buck, viz., waterbuck, hartebeest, mpala, warthog, and a native dog were found to be infected with human trypanosomes.

Mailed June 1, 1912.